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ACIDIC PRECIPITATION IN ONTARIO STUDY

PRECIPITATION CONCENTRATION AND WET DEPOSITION FIELDS OF POLLUTANTS IN ONTARIO, SEPTEMBER 1980 TO DECEMBER 1981

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SYNOPSIS

This report presents the precipitation concentration and wet deposition fields in Ontario from the cumulative sampling network for acidity, sulfates, nitrates and a number of other ions and trace metals, for the period September 1980 to December 1981. As a preliminary estimate, the deposition results shown are thought to be accurate to about 20% to 30% for hydrogen ions, sulfates and nitrates. For some of the trace metals and soil-related parameters, the accuracy is probably poorer. Work is in progress to better define the accuracy of our measurements. The occasional inconsistencies noted between networks operating within or near the borders of the province (particularly involving the CANSAP data) indicate that there are still data compatability problems in the accurate determination of deposition fields and the interpretation of results from data collected from different networks.

The annual deposition fields of several parameters, notably sulfates and nitrates, show the general features predicted by current long-range transport models, with much higher values in the southern than the northern part of the province. The wet sulfate loading of 20 kg $ha^{-1}y^{-1}$, which has been suggested by Canadian scientists as being critical for sensitive water bodies, is exceeded in all of southern Ontario. Other substances, which are strongly related to windblown soil (Ca^{++}, Mg^{++}, K^{+}, Fe, Al), show the influence of agricultural activities in the province. The large smelter sources of sulfur and trace metal emissions at Sudbury are difficult to detect in the present results: only those for copper show a suggestion of a contribution to wet deposition from smelter emissions.

There is a rather pronounced trend in the seasonal concentration and deposition for a number of substances. Most notable among these is $SO_4^{=}$, with the highest deposition values occurring during the summer, and lowest values during the winter (hydrogen ions follow a similar trend). On the other hand, the acid-related nitrates show much less variation throughout the year.

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1. INTRODUCTION

In response to the need to understand the acid rain and the long range transport of pollutants phenomena, the Ontario Ministry of the Environment set up two networks to monitor both wet and dry deposition of selected pollutants, in the latter part of 1980, under the auspices of the Acidic Precipitation in Ontario Study (APIOS). The purpose of the cumulative network (1) which sampled over a monthly period from its inception to the end of 1981 (and later adopted a 28-day sampling period as of January 5, 1982) is to determine the long term deposition pattern in Ontario. The event network (2), which samples on a daily basis, is designed to define the sector of origin of the pollutants at the receptors, as well as the frequency and intensity of acidic deposition episodes. This report summarizes the findings of the cumulative network from its inception to the end of 1981.

The cumulative network (1) began its operation in September, 1980 at 32 sampling sites, which were distributed more densely in southern Ontario than northern Ontario. The network has since been expanded to 36 sites by mid-1982. Stringent siting criteria were followed to ensure that the sites are regionally representative. The basic instrument used is the Sangamo wet/dry collector. Precipitation samples are collected in polyethylene bags inserted into the sampling container. At each site it is co-located with a storage precipitation gauge which serves as the primary standard of precipitation depth during the sampling period. Aside from the acid and base-related contaminants, other selected major ions, nutrients and trace metals are also determined. All samples are analyzed in the Ministry's Laboratory Services Branch and the data are stored in the Ministry's Sample Information System (SIS) in Toronto. Chemical analysis techniques are described in another report (3).

2. DATA PRESENTATION AND ANALYSIS APPROACH

Both precipitation concentration and wet deposition results are presented in this report on an annual and seasonal basis in Tables 1 to 12. In each table, "ID" stands for station identification and these stations are shown in Figure 1a. Station names are given in Table 13. The same station numbers are used in the contour plots. The raw data are published elsewhere (4).

Precipitation-weighted (measurement by primary gauges) concentrations, and cumulative wet-deposition over the periods of interest, were used in generating the contour plots. The storage gauge data were used to determine deposition. In a few cases when storage gauge data were not available, interpolated information from nearby Atmospheric Environment Service CLIMAT stations was used as a substitute. In general, a station needed at least 8 out of 12 data points over the year before the average station concentration and cumulative deposition were used in the contour calculations. In the case of deposition results where some data points were missing, proration was used to estimate the total annual deposition.

It should be noted that during the summer months, a certain amount of sample evaporation takes place, even from a collector with an automatically-operated cover. This leads to artificially elevated concentrations of the sample constituents, as well as positive errors in the deposition (since we are multiplying the measured concentration by a standard rain gauge depth). Work is underway to quantify this error, but preliminary results indicate it to be less than about 15%. During the winter months, a problem in measuring deposition is the relatively poor collector efficiency. Work is also underway to quantify this error, but preliminary results indicate it to be about 25%. As a preliminary estimate, the deposition results shown are thought to be accurate to better than about 20% to 30% for hydrogen ions, sulfates and nitrates. For some of the trace metals and soil-related

parameters, the accuracy is probably poorer. Work is in progress to better define the accuracy of our measurements.

Concentration field and deposition field contours were first generated from the station data using a linear interpolation computer program. Where applicable, data from other networks in and surrounding Ontario were also used to assess the overall pattern. 1981 data from three major networks other than the Ontairo network have been examined, namely the CANSAP (Canadian Network for Sampling Precipitation)(5), the GLPN (Great Lakes Precipitation Network)(6), and the NADP (National Atmospheric Deposition Program)(7). The GLPN concentration data were consistently higher than those of the other networks in Ontario and consequently were not used in the contour calculations. It should be pointed out that the data from the NADP are only preliminary and have not been validated (7). Since not all networks have results on nutrients and trace metals, some contours were generated using only the Ontario network data. Only the most relevant features of these computer-drawn contours in Ontario are retained.

3. RESULTS AND DISCUSSION

In this section, results summarized in Tables 1 and 2 are presented as average annual precipitation concentration and wet deposition contours in Ontario in Figures 2 to 20. No contours of Ni and V are shown in this report because most of the observed concentrations were at the detection limits. In all the isopleth diagrams the station numbers are given on the left hand bottom of each monitoring station whereas the results are indicated on the right hand top of the stations. Station identifications are given in Table 13. A discussion of the seasonal variation of concentration and deposition is also included. However, it is useful to first consider the annual precipitation pattern in Ontario.

3.1 Annual Precipitation Field

Figure 1b shows the contours of 1981 annual precipitation depth in Ontario using reported data from the Environment Canada CLIMAT network. Even though the deposition results in this report are not calculated from these CLIMAT isopleths, these contours do shed some light on the dependence of the observed deposition patterns on precipitation quantity, since the two are generally closely related.

Precipitation is in general higher in southwestern and southeastern Ontario with a typical range of 80 to 110 cm per annum. There is a SE-to-NW gradient and the precipitation depth is about 50-60 cm per annum in the north. Annual precipitation totals exceeded 125% of normal in parts of southern Ontario. However, in northern Ontario, totals were less than 75% of normal.

3.2 Annual Concentration and Deposition Fields

3.2.1 H_f^+:

The free hydrogen ion concentration (calculated from pH measurements) field is given in Figure 2a. There seems to be some discontinuity in the APIOS and CANSAP data; there are extremely high and extremely low values in the CANSAP results, e.g. 90.8, 6.79 and 0.41 ug l^{-1} respectively for stations 55, 56 and 58. The lowest value may be related to the observed Ca^{++} concentration. Aside from these anomalous results, free hydrogen concentrations are in the range of 50-70 ug l^{-1} in southern and central Ontario, with values in the 80's ug l^{-1} in the southernmost part. A SE-to-NW gradient is observed with generally lower values in the western portion of the province.

The corresponding H_f^+ deposition field is given in Figure 2b. In general, it is rather similar to the concentration field. The extremely low value at station #40 is unexpected and may reflect bad data at that site. Similarily, the maximum at station #55 may be an artifact. In general, the deposition of free hydrogen ions in southern Ontario is in the range of 50-70 mg m^{-2}, with considerably lower values being observed in the northern part of the province.

3.2.2 H_t^+:

The total hydrogen ion (free plus complexed hydrogen ion) concentration and deposition fields are shown in Figures 3a and 3b. The patterns are rather similar to those of the free hydrogen. Higher total hydrogen ion concentrations are observed in the southwestern and south-central parts of Ontario ranging typically from 80 to 100 ug l^{-1}. There is a S-to-N gradient in both the concentration and deposition fields.

It is interesting to note that, typically, free hydrogen ions make up 60-80% of the total acidity in the south but decrease to as low as 20% in the northern part of the province (compare Figures 2a and 3a). The amount of un-dissociated acids is distributed quite uniformly across the province.

3.2.3 $SO_4^=$:

The concentration and deposition fields are shown in Figures 4a and 4b. The values around Hudson Bay have not been corrected for any sea salt contribution. The concentration maximum appears in the southernmost part of the province. Typical concentrations in the south and south-central regions range from 3.5 to 5 mg l^{-1}, and a SE-to-NW gradient is seen. In general, data from the APIOS, CANSAP, and NADP networks are rather consistent with the exception of anomalous values at two CANSAP stations, i.e. #58 and #59.

The deposition field is quite similar to that of the concentration and its general features resemble the predictions of long-range transport models, which take into account prevailing wind patterns and emission source distributions (see eg. reference 8). Deposition at station #58 is unusually high due to the corresponding high CANSAP $SO_4^=$ concentration. An unexpectedly low deposition value is observed at the NADP station #40.

Note that sulfate wet loadings in excess of 2 g m^{-2} y^{-1} (20 kg ha^{-1} y^{-1}) - a value proposed by some investigators as critical for sensitive water bodies (9) - are generally exceeded to the south of central Ontario, i.e. south of stations #25 and 26.

3.2.4 $N\text{-}NO_3^-$:

Contours of $N\text{-}NO_3^-$ concentration and deposition are shown in Figures 5a and 5b. The NADP concentration data are somewhat lower than the APIOS ones. There is a S-to-N gradient with concentrations ranging typically from 0.4 to 0.6 mg l^{-1} in the south and less than 0.2 mg l^{-1} in the north. Extremely high and low values are observed at CANSAP stations #55 and #59. The deposition field is similar to that of the concentration with a gradient also along the SE-to-NW direction.

It is of interest to note that the ratio of $SO_4^=/N\text{-}NO_3^-$ in Ontario is typically 5 to 7 (compare Figures 4a and 5a). In terms of sulfate-to-nitrate equivalents, this ratio is 1.4 to 2.0. A mild gradient along the SE to NW axis is observed. In general, the data are consistent in the APIOS and NADP networks with the exception at the NADP site #40. Some CANSAP stations (#55, 58 and 59) have rather high ratios.

3.2.5 $N\text{-}NH_4^+$:

Concentration and deposition fields are given in Figures 6a and 6b. Typical concentrations in southern and central Ontario are in the range of 0.3 to 0.5 mg l^{-1}. Anomalous values are observed in some CANSAP (#59) and NADP (#39, 45 and 51) sites. The deposition profile is similar to that of the concentration with a maximum in southern Ontario.

3.2.6 N-TKN (Total Kjeldahl Nitrogen expressed as nitrogen) and $P\text{-}PO_4^{3-}$ (Phosphate as phosphorus):

Contours of concentration and deposition of N-TKN are shown in Figures 7a and 7b. Concentrations are quite uniform in southern and central Ontario (in the range of 0.5 to 0.8 mg l^{-1}) as well as in the northern part (0.4

to 0.5 mg l^{-1} range) of the province. The S-to-N gradient in the deposition field is somewhat steeper.

Isopleths of concentration and deposition of $P\text{-}PO_4^{3-}$ are given in Figures 8a and 8b. Concentration ranges from less than 15 ug l^{-1} to greater than 75 ug l^{-1} with minimum values around south-central Ontario. The deposition pattern is similar to that of the concentration with only minor modifications.

3.2.7 Cu:

Figures 9a and 9b are the concentration and deposition contours. Typical concentrations range from 3 to 5 ug l^{-1}. Somewhat elevated values are noted to the south of the Sudbury area, which may be due to the smelters there. The annual deposition profile is similar to that of the concentration and is fairly uniform with typical values in the range of 2.5 to 4.5 mg m^{-2}.

3.2.8 Fe, Al, Ca^{++}, Mg^{++} and K^{+}:

Concentration and deposition profiles of Fe are shown in Figures 10a and 10b. Typical Fe concentrations are in the range of 50 to 70 ug l^{-1}. Unusually high values are observed at stations #5 and 24. The deposition profile is similar to that of the concentration profile.

Contours of Al are shown in Figures 11a and 11b. The concentration pattern is rather similar to that of Fe, no doubt reflecting the dominant soil contibution to both of these substances. Typical concentrations in south and south-central Ontario range from 35 to 60 ug l^{-1}. A maximum occurs at station #24 and might indicate local source contributions. The observed minimum at #18 of Al is not seen in the Fe profile. The deposition pattern is similar to that of the concentration.

Figures 12a and 12b show the concentration and deposition fields of Ca^{++}. In general, concentration is higher in the southern agricultural areas and lower in the north (Canadian Shield area) and the pattern is consistent in both APIOS and NADP observations. The CANSAP data (stations #53, 55, 56, 57 and 58) are consistently higher and possibly are due to local contamination by windblown soil. Minimum values along a SE to NW axis in central and south-central Ontario are consistent with the geology of the area. The deposition pattern is similar to that of the concentration. Deposition is again higher in some CANSAP sites.

Mg^{++} concentration and deposition contours are shown in Figures 13a and 13b. The typical concentration range is from 0.02 to 0.07 mg l^{-1} even though values higher than these are also observed. The APIOS data are consistent with those of the NADP network but not necessarily with those in the CANSAP network. The deposition profile differs only somewhat from that of the concentration.

Figures 14a and 14b are the K^{+} concentration and deposition contours respectively. The concentration pattern is quite irregular. Extremely high values (due to suspected contamination) are observed at stations #7, 17, 18, 25, 40, 45, 56 and 58. NADP station values are in general lower except the ones (#40 and 45) indicated above. Deposition contours are somewhat modified from those of the concentration.

3.2.9 Pb, Zn, Mn and Cd:

Concentration and deposition data of Pb are given in Figures 15a and 15b. Concentration values in south and south-central Ontario are typically around 6 to 10 ug l^{-1}, and there is a S-to-N gradient probably largely due to

the low density of automotive traffic in northern Ontario and the effects of long-range transport. The concentration pattern is somewhat irregular with anomalously high values around stations #10 and 18. The deposition pattern is similar to that of the concentration.

Zn data are shown in Figures 16a and 16b. Typical concentrations are around 8-12 ug l^{-1}. There is an anomalously high value at site #5. The deposition pattern is relatively more uniform compared to that of the concentration, but there is also an irregular decrease from S to N by as much as a factor of 2 to 3.

Mn results are shown in Figures 17a and 17b. The concentration profile is quite irregular. Typical concentrations are around 4 to 5 ug l^{-1} in southern and south-central Ontario. High values appear at stations #7, 24 and 30 and a low value around station #19. The deposition profile is similar to that of the concentration.

Concentration and deposition contours of Cd are shown in Figures 18a and 18b. Except at station #18 with an anomalously high concentration, all other stations have typical concentration values around less than 0.1 to 0.3 ug l^{-1}. The deposition pattern is somewhat more uniform. As some concentration data were at the detection limit, these contours should be regarded as being only qualitative.

3.2.10 Na^+ and Cl^-:

Na^+ contours are given in Figures 19a and 19b. No sea salt correction has been made for the data. It is observed that the CANSAP concentrations are consistently higher than those of APIOS. There are also occasional high

values in the APIOS (stations #10 and 14) and NADP (stations #43, 46 and 48) networks. The deposition pattern is quite similar to that of the concentration.

Concentration and deposition isopleths of Cl^- are given in Figures 20a and 20b. In general, the concentration is quite uniform in the province in the range of 0.1 to 0.25 mg l^{-1}. Anomalies are found in stations #56 and 58. The deposition profile is similar to that of the concentration.

3.3 Seasonal Trends

Seasonal average concentration and deposition results for 5 seasons (autumn 1980 to autumn 1981) are given in Tables 3 to 12. The four seasons are defined as autumn (September to November), winter (December to February), spring (March to May) and summer (June to August). Comments are only made in general terms regarding the average pattern in the province. For details about specific sites, please refer to the Tables.

3.3.1 Concentration

For most parameters (including $SO_4^=$ and NO_3^-) concentration in the winter of 1980/81 was lower than that of the autumn of the same year. Exceptions to this include H_f^+ which was about the same in both seasons and H_t^+, Cl^-, Na^+, Pb and Cu, which were observed to be higher. There was a subsequent increase in concentration in the spring of 1981, with the exception of H_f^+, Cl^- and Pb which were lower, and H_f^+ which was about the same with respect to the winter of 1980/81. In the summer of 1981 most parameters decreased in concentration with respect to the spring levels. Exceptions were H_f^+, H_t^+ and Pb (which were higher) and $SO_4^=$, K^+ and PO_4^{3-} (which

were about the same). There was a further decrease in the autumn of 1981, with the exceptions of Zn, Pb, Cu and Cd (which were higher) and Na^+, PO_4^{3-} and Mn (which were about the same).

Most parameters peaked during either spring or summer. Due to the different relative changes in $SO_4^=$ and NO_3^-, the $SO_4^=/NO_3^-$ ratio was maximum in the summer and minimum in the winter. These observations are in general agreement with other work (see for example reference 10).

It is expected that the observed concentration of H_f^+ was highly correlated with the corresponding levels of $SO_4^=$, NO_3^-, NH_4^+, Ca^{++} and Mg^{++}. Seasonal concentration variations of Ca^{++} and Mg^{++} were observed as expected to be related to the ground cover.

3.3.2 Deposition

Deposition of most parameters decreased in the winter of 1980/81 with respect to that of the autumn. Exceptions were Na^+ and Cl^- (which were higher due to road salt contributions) and Zn and Cu (which were about the same). For most parameters, in the spring of 1981, the deposition increased, except H_f^+, H_t^+, Na^+, Zn and Pb (which were about the same). In the summer of 1981, about one-half of the parameters increased in deposition and the other half decreased in deposition. NO_3^- was an exception in that it remained about the same. Most parameters decreased in deposition in the autumn of 1981 with respect to the summer with the exceptions of Ca^{++} (which increased) and PO_4^{3-}, Zn, Pb, Al and Cu (which remained about the same).

The deposition results are highly correlated with precipitation depth, as has been already noted in Section 3.1, and this is also reflected in their seasonal variation - see in Tables 8 to 12 and Figures 21 to 25. Of course, also superimposed on the effects of precipitation depth, are the seasonal variations in concentration. It is interesting to note that for sulfates, there is a strong seasonal dependence of deposition. The network-wide average seasonal sulfate deposition (mg m^{-2} $season^{-1}$), from autumn 1980 through autumn 1981, varied as follows: 650, 370, 720, 1070 and 680. Maximum values occurred in the summer, and minima during the winter months. The deposition of hydrogen ions followed a similar pattern. On the other hand, nitrates showed much less variation through the year, with corresponding network-wide averages (mg $N\text{-}NO_3$ m^{-2} $season^{-1}$, autumn 1980 through autumn 1981) being: 106, 81, 101, 114 and 95.

REFERENCES

1. Chan, W.H., D.B. Orr, and R.J. Vet (1982), "The Acidic Precipitation in Ontario Study (APIOS) - An Overview. The Cumulative Wet/Dry Deposition Network", Ontario Ministry of the Environment report, ARB-15-82-ARSP.

2. Chan, W.H., D.B. Orr, and R.J. Vet (1982), "The Acidic Precipitation in Ontario Study (APIOS) - An Overview. The Event Wet/Dry Deposition Network", Ontario Ministry of the Environment report, ARB-11-82-ARSP.

3. MOE (1981), "Outlines of Analytical Methods", Ontario Ministry of the Environment, Laboratory Services Branch report.

4. MOE (1983), "Monthly 28 Day Cumulative Precipitation Chemistry Listings, June 1980 - December 1981", Ontario Ministry of the Environment report, ARB-53-83-ARSP.

5. "CANSAP Data Summary, 1981" (1982), Environment Canada Atmospheric Environment Service Report UDC: 551.578.8.

6. Chan, C.H. (1982), unpublished results.

7. Gibson, J.H. (1982), "NADP Data Summary of 1981 Annual Averages (Preliminary Data)".

8. Venkatram, A., B.E. Ley, S.W. Wong (1982), "A Statistical Model to Estimate Long-Term Concentrations of Pollutants Associated with Long-Range Transport and its Application to Emissions for the Sudbury Region", Ontario Ministry of the Environment report, ARB-36-81-SES.

9. MOI (1983), Canada-U.S.A. Memorandum of Intent, Work Group 1 (Impact Assessment) Final Report, January.

10. Barrie, L.A., K.G. Anlauf, H.A. Wiebe, and P. Fellin (1983), Acidic Pollutants in Air and Precipitation at Selected Rural Locations in Canada, Proceedings of the American Chemical Society Symposium on Acid Rain, J. Teasley (ed), Ann Arbor Science.

Table 1:

GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L) - 1981

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.0869	0.1244	5.40	0.647	0.470	0.258	0.618	0.1099	0.0679	0.0913	0.522
2	0.0761	0.1040	4.74	0.637	0.495	0.240	0.679	0.1140	0.0656	0.0909	0.536
3	0.0864	0.1125	4.69	0.657	0.362	0.195	0.691	0.0898	0.0454	0.0629	0.489
4	0.0539	0.0863	5.25	0.690	0.602	0.275	0.884	0.0982	0.0656	0.0794	0.729
5	0.0617	0.0974	4.00	0.631	0.468	0.171	0.669	0.0888	0.0717	0.0654	0.488
6	0.0407	0.0754	2.50	0.400	0.240	0.080	0.370	0.0250	0.0200	0.0200	0.356
7	0.0783	0.0801	3.83	0.630	0.561	0.224	0.777	0.1547	0.1002	0.0902	0.613
8	0.0500	0.0850	4.39	0.558	0.409	0.201	0.839	0.1108	0.0623	0.1039	0.707
9	0.0623	0.0947	3.46	0.556	0.247	0.139	0.564	0.0512	0.0365	0.0582	0.437
10	0.0680	0.0822	4.73	0.640	0.520	0.315	0.840	0.1162	0.0573	0.1748	0.703
11	0.0649	0.0927	4.20	0.586	0.492	0.229	0.737	0.0699	0.0400	0.0673	0.510
12	0.0533	0.0819	2.26	0.328	0.183	0.079	0.297	0.0153	0.0372	0.0335	0.203
13	0.0504	0.0849	3.30	0.520	0.335	0.196	0.592	0.0449	0.0515	0.0871	0.453
14	0.0648	0.1002	3.63	0.516	0.278	0.221	0.566	0.0421	0.0716	0.1293	0.442
15	0.0366	0.0659	3.43	0.487	0.587	0.178	0.690	0.1264	0.0560	0.0943	0.389
16	0.0579	0.0857	3.31	0.479	0.341	0.198	0.591	0.0424	0.0581	0.1042	0.294
17	0.0680	0.1060	3.53	0.484	0.260	0.184	0.491	0.0489	0.0952	0.0753	0.360
18	0.0669	0.1019	3.67	0.499	0.205	0.136	0.656	0.0302	0.1263	0.0525	0.445
19	0.0576	0.0875	2.85	0.375	0.145	0.100	0.462	0.0196	0.0566	0.0352	0.309
20	0.0659	0.1037	3.64	0.513	0.249	0.135	0.551	0.0397	0.0402	0.0494	0.419
21	0.0616	0.0964	3.03	0.509	0.248	0.175	0.562	0.0490	0.0811	0.0738	0.464
22	0.0552	0.0887	3.14	0.375	0.225	0.148	0.450	0.0381	0.0696	0.0688	0.321
23	0.0689	0.1035	3.67	0.527	0.276	0.104	0.657	0.0471	0.0459	0.0435	0.493
24	0.0444	0.0798	3.01	0.350	0.231	0.109	0.565	0.0445	0.0616	0.0504	0.369
25	0.0433	0.0844	3.25	0.323	0.199	0.092	0.515	0.0334	0.1027	0.0526	0.340
26	0.0417	0.0730	2.25	0.308	0.214	0.076	0.410	0.0334	0.0513	0.0447	0.281
27	0.0345	0.0579	1.84	0.263	0.171	0.092	0.449	0.0498	0.0853	0.0431	0.347
28	0.0338	0.0388	1.37	0.175	0.471	0.125	0.408	0.0822	0.0519	0.0561	0.299
30	0.0309	0.0384	1.78	0.283	0.458	0.120	0.474	0.0902	0.0644	0.0420	0.294
31	0.0307	0.0618	1.69	0.311	0.184	0.064	0.435	0.0258	0.0355	0.0451	0.285
34	0.0306	0.0627	1.84	0.366	0.195	0.020	0.487	0.0238	0.0200	0.0246	0.426
35	0.0106	0.0431	1.20	0.224	0.144	0.122	0.552	0.0631	0.0688	0.0533	0.357
36	0.0081	0.0446	1.13	0.197	0.331	0.128	0.368	0.0628	0.0750	0.0545	0.199

Table 1 (contd.)

GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L) - 1981

ID	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	0.0216	0.00493	0.000542	0.01304	0.0694	0.01118	0.00100	0.0549	0.00436	0.000195
2	0.0213	0.00379	0.001292	0.00731	0.0605	0.00792	0.00100	0.0491	0.00321	0.000183
3	0.0202	0.00501	0.000560	0.01106	0.0454	0.00824	0.00100	0.0498	0.00369	0.000269
4	0.0383	0.00590	0.000550	0.01183	0.0682	0.01006	0.00100	0.0553	0.00433	0.000311
5	0.0205	0.00590	0.000855	0.02001	0.0803	0.00734	0.00105	0.0645	0.00401	0.000244
6	0.0080	0.00200	0.000500	0.00637	0.0286	0.00700	0.00100	.	0.01150	0.000100
7	0.0327	0.00652	0.000796	0.01223	0.0765	0.00908	0.00100	0.0584	0.00507	0.000310
8	0.0188	0.00477	0.001149	0.01430	0.0591	0.00961	0.00100	0.0461	0.00472	0.000248
9	0.0189	0.00287	0.000749	0.00863	0.0451	0.00751	0.00100	0.0306	0.00316	0.000266
10	0.0284	0.00569	0.000746	0.01266	0.0736	0.01527	0.00111	0.0427	0.00266	0.000332
11	0.0191	0.00446	0.000586	0.00802	0.0553	0.00850	0.00100	0.0412	0.00364	0.000271
12	0.0128	0.00157	0.000624	0.00792	0.0346	0.00668	0.00100	0.0192	0.00208	0.000224
13	0.0257	0.00342	0.000612	0.00942	0.0574	0.00747	0.00108	0.0530	0.00423	0.000215
14	0.0283	0.00284	0.000592	0.00741	0.0380	0.00845	0.00100	0.0292	0.00349	0.000097
15	0.0386	0.00522	0.000843	0.01011	0.0548	0.00779	0.00100	0.0411	0.00354	0.000093
16	0.0372	0.00384	0.000585	0.00945	0.0577	0.00946	0.00100	0.0410	0.00431	0.000275
17	0.0377	0.00354	0.000529	0.00932	0.0703	0.00762	0.00109	0.0585	0.00363	0.000225
18	0.0156	0.00391	0.001055	0.01162	0.0708	0.01079	0.00100	0.0308	0.00489	0.001873
19	0.0207	0.00250	0.000735	0.00801	0.0597	0.00518	0.00100	0.0380	0.00427	0.000160
20	0.0132	0.00414	0.000712	0.00720	0.0716	0.00642	0.00100	0.0487	0.00173	0.000157
21	0.0135	0.00342	0.000849	0.01053	0.0574	0.00565	0.00122	0.0418	0.00502	0.000194
22	0.0135	0.00491	0.001602	0.01302	0.0979	0.00621	0.00100	0.0909	0.00266	0.000229
23	0.0143	0.00488	0.001277	0.01284	0.0328	0.00695	0.00100	0.0852	0.00400	0.000188
24	0.0429	0.00644	0.001067	0.01462	0.1537	0.00562	0.00100	0.1502	0.00343	0.000225
25	0.0751	0.00469	0.000786	0.01193	0.0741	0.00707	0.00100	0.0574	0.00307	0.000332
26	0.0163	0.00451	0.000758	0.01030	0.0692	0.00448	0.00146	0.0756	0.00347	0.000096
27										
28	0.0395	0.00246	0.000399	0.01115	0.0229	0.00307	0.00100	0.0182	0.00338	0.000259
30	0.0066	0.00277	0.001383	0.00832	0.0345	0.00436	0.00100	0.0239	0.00804	0.000164
31	0.0266	0.00746	0.000500	0.00834	0.0899	0.00393	0.00108	0.0476	0.00442	0.000097
34	0.0240	0.00187	0.000500	0.00862	0.0434	0.00428	0.00100	0.0358	0.00409	0.000097
35	0.0146	0.00292	0.000500	0.00920	0.0456	0.00516	0.00100	0.0211	0.00628	0.000146
36	0.0502	0.01525	0.003343	0.00942	0.0470	0.00644	0.00150	0.0406	0.00656	0.000128
	0.0317	0.00634	0.000500	0.00539	0.0773	0.00287	0.00100	0.0575	0.00624	0.000156

Table 2:

ANNUAL DEPOSITION (MG/M**2) - 1981

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	83.4	119.4	4852	605.6	446.5	231.8	587.4	101.6	61.9	85.6	462.2	20.7	5.08	0.573	13.44	71.5	11.52	1.031	56.6	4.49	0.201
2	68.4	94.3	4003	537.6	486.0	203.0	615.5	112.0	59.5	82.5	485.8	19.3	3.73	1.268	7.17	59.4	7.78	0.982	48.3	3.15	0.179
3	65.2	84.9	3815	534.9	298.9	158.4	521.5	67.8	34.3	47.5	369.1	15.2	4.11	0.422	8.35	39.2	6.22	0.755	39.3	2.78	0.203
4	45.2	73.6	3910	545.5	582.2	228.9	762.2	89.8	56.6	71.3	650.5	33.0	5.02	0.469	10.08	53.3	8.57	0.852	43.2	3.69	0.265
5	55.4	87.5	3623	571.5	468.3	139.4	505.6	82.4	64.0	57.8	442.3	18.6	5.35	0.774	18.13	76.2	6.65	0.950	58.4	3.63	0.232
6	59.3	109.8	3639	582.2	349.3	116.4	538.6	36.4	29.1	29.1	518.2	11.6	2.91	0.728	9.28	41.6	10.19	1.456	.	16.74	0.146
7	49.1	53.8	2571	453.0	363.4	160.8	477.5	95.4	64.4	60.2	376.6	20.1	4.80	0.586	8.90	55.6	6.68	0.736	42.5	3.73	0.228
8	40.2	73.4	3577	457.2	328.7	164.8	732.4	97.7	50.8	85.2	576.8	16.2	4.43	1.068	13.29	55.1	8.93	0.929	42.9	4.05	0.212
9	51.7	76.9	2761	446.4	197.6	111.1	467.8	40.9	30.3	46.5	363.6	15.7	2.21	0.576	6.64	34.7	5.78	0.799	23.5	2.53	0.204
10	73.1	71.9	3890	552.4	528.2	308.2	699.5	114.9	47.4	160.1	576.1	24.3	5.62	0.667	10.65	65.2	13.66	0.997	41.2	2.69	0.297
11	59.2	90.9	3967	553.8	547.4	230.7	722.6	68.5	39.2	65.9	481.5	18.7	4.23	0.557	7.62	52.5	8.07	0.950	39.1	3.46	0.257
12	49.1	75.4	2081	302.1	168.7	72.8	273.1	14.1	34.3	30.8	186.5	11.8	1.45	0.574	7.30	31.9	6.16	0.921	17.7	1.92	0.206
13	42.1	75.7	2707	430.8	277.4	160.8	516.1	36.9	42.6	71.5	377.9	21.3	3.22	0.577	8.88	60.1	7.04	1.016	53.6	3.98	0.202
14	67.4	105.5	3771	535.7	289.3	229.7	596.5	43.9	74.3	134.3	459.5	29.8	3.27	0.682	8.32	48.4	9.72	1.151	33.6	4.02	0.112
15	37.6	71.9	3468	491.5	575.7	179.9	694.3	124.2	55.6	95.2	392.6	40.0	5.70	0.921	11.04	52.6	8.51	1.092	39.5	3.87	0.102
16	55.4	78.4	3030	438.9	311.8	181.7	614.6	38.8	55.6	97.3	305.6	36.7	4.05	0.617	10.18	62.1	9.98	1.055	44.2	4.48	0.295
17	59.8	93.1	3098	425.1	228.4	162.1	418.0	43.0	83.6	66.3	316.6	33.1	3.23	0.482	8.49	64.1	6.95	0.998	53.3	3.31	0.205
18	54.1	86.5	3331	453.7	186.6	123.2	533.7	27.5	114.8	47.7	360.3	12.7	3.65	0.985	10.08	66.0	10.07	0.933	28.8	4.56	1.747
19	58.5	88.8	2893	381.1	147.5	101.5	469.8	19.9	57.5	35.8	314.0	21.6	2.82	0.827	9.02	67.2	5.83	1.126	42.8	4.80	0.180
20	63.1	102.3	3596	506.3	238.6	134.1	558.1	38.0	38.5	47.3	441.4	12.7	4.06	0.698	7.06	70.2	6.30	0.981	47.7	1.69	0.154
21	58.1	90.9	2833	476.7	219.4	154.1	566.2	43.1	67.4	64.7	401.9	12.7	3.45	0.856	10.61	57.9	5.69	1.231	42.1	5.06	0.196
22	58.2	101.4	3306	394.8	237.4	155.8	513.9	41.5	73.3	70.1	338.3	15.4	5.61	1.830	14.54	109.2	7.09	1.143	112.3	2.97	0.262
23	46.9	73.3	2523	377.9	187.7	78.9	507.5	32.1	32.5	33.3	335.7	11.0	3.91	1.023	10.29	29.7	5.57	0.801	72.9	3.28	0.150
24	36.4	70.9	2466	286.9	174.4	89.3	490.7	35.1	53.0	44.7	302.7	37.3	5.72	0.948	12.99	125.4	4.99	0.888	122.6	2.96	0.199
25	30.9	68.2	2439	230.5	160.8	66.0	355.1	27.0	88.4	42.4	206.8	60.7	3.89	0.609	9.92	64.9	5.47	0.775	50.2	2.38	0.257
26	33.6	58.8	1814	247.7	172.6	60.9	330.4	26.4	42.0	36.0	226.5	13.1	3.90	0.655	8.37	62.6	3.87	1.264	68.0	3.00	0.083
27	25.3	43.4	1194	170.2	128.1	59.4	336.2	36.1	61.8	31.2	234.5	29.6	2.12	0.516	9.61	19.7	2.65	0.862	15.7	2.92	0.223
28	26.0	30.6	772	98.3	335.1	75.4	238.0	63.2	48.4	36.2	168.5	3.8	2.22	1.110	6.67	27.7	3.50	0.802	19.2	6.45	0.131
30	11.0	17.7	819	130.2	210.8	55.1	217.8	41.5	29.6	19.6	135.1	12.2	3.77	0.253	4.22	46.8	1.99	0.544	24.1	2.23	0.049
31	19.7	39.6	1087	199.5	118.4	41.2	301.9	16.6	22.8	29.0	182.9	16.6	1.40	0.373	6.43	32.4	3.19	0.746	26.7	3.05	0.072
34	9.2	18.9	554	109.9	58.6	6.0	146.5	7.1	6.0	7.4	128.0	4.4	0.88	0.150	2.77	13.7	1.55	0.301	6.3	1.89	0.044
35	6.2	26.4	664	123.9	93.3	67.3	270.3	34.9	39.6	32.5	197.2	28.9	9.41	2.062	5.81	28.2	3.97	0.925	24.3	4.05	0.079
36	5.1	26.7	629	104.7	218.3	68.3	219.0	42.4	45.0	35.3	108.2	18.9	4.56	0.360	3.87	50.5	2.07	0.719	37.5	4.49	0.112

Table 3:

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=AUTUMN80

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.0520	0.0967	4.90	0.774	0.714	0.284	1.203	0.1664	0.0691	0.0687	0.872
2	0.0457	0.0760	3.82	0.792	0.660	0.277	1.239	0.1220	0.0749	0.0680	0.839
3	0.0407	0.0814	4.48	0.764	0.650	0.317	0.626	0.1246	0.0483	0.0700	0.472
4	0.0711	0.1099	5.10	0.754	0.607	0.350	0.881	0.1427	0.0770	0.0777	0.685
5	0.0763	0.1093	4.90	0.727	0.521	0.319	1.069	0.1122	0.1302	0.0636	0.674
7	0.0457	0.0821	3.36	0.606	0.455	0.252	1.022	0.0907	0.0553	0.0507	0.532
8	0.0168	0.0578	4.12	0.606	0.763	0.272	1.286	0.1409	0.0600	0.0592	0.903
9	0.0349	0.0766	2.96	0.599	0.503	0.099	0.962	0.0776	0.0336	0.0536	0.652
10	.	0.0602	5.97	0.659	0.690	0.306	1.296	.	0.1120	0.0025	1.095
11	0.0465	0.0838	3.41	0.704	0.712	0.201	1.075	0.0847	0.0898	0.0629	0.689
13	0.0635	0.0843	3.16	0.814	0.750	0.280	0.670	0.0767	0.1268	0.1435	0.366
14	0.0646	0.0990	2.86	0.539	0.254	0.131	0.717	0.0356	0.0243	0.0452	0.379
15	0.0933	0.0745	3.66	0.479	0.300	0.152	0.575	0.0800	0.0658	0.0811	0.402
16	0.0536	0.0894	3.40	0.612	0.586	0.214	0.779	0.0897	0.1251	0.1089	0.438
17	0.0800	0.0817	2.56	0.420	0.205	0.156	0.660	0.0662	0.1514	0.0833	0.341
18	0.0734	0.0811	3.37	0.704	0.326	0.325	0.974	0.0582	0.1873	0.0197	0.690
19	0.0420	0.0729	2.18	0.323	0.121	0.036	0.483	0.0162	0.0178	0.0066	0.402
20	0.0370	0.0739	2.25	0.341	0.268	0.112	0.560	0.0339	0.0585	0.0072	0.374
21	0.1034	0.1033	4.07	0.571	0.496	0.114	0.641	0.0607	0.0700	0.1000	0.479
22	0.0398	0.0903	2.64	0.577	0.190	0.150	0.791	0.0350	0.0700	0.0500	0.583
23	0.0625	0.0968	3.02	0.510	0.305	0.098	0.538	0.0356	0.0504	0.0454	0.405
24	0.0466	0.0739	1.93	0.275	0.149	0.040	0.264	0.0125	0.0298	0.0298	0.193
25	0.0563	0.0851	2.30	0.276	0.177	0.042	0.262	0.0162	0.0193	0.0268	0.221
26	0.0331	0.0641	2.10	0.239	0.212	0.193	0.426	0.0267	0.0300	0.0500	0.266
27	0.0126	0.0468	2.71	0.353	0.410	0.116	0.570	0.0713	0.1060	0.0563	0.370
28	0.0191	0.0376	1.17	0.121	0.663	.	0.439	0.0476	0.0339	.	0.270
30	.	0.0264	0.98	0.157	0.899	0.097	0.501	.	0.0846	0.0528	0.185
31	0.0242	0.0530	1.33	0.248	0.226	0.065	0.342	0.0333	0.0225	0.0241	0.254
35	0.0110	0.0346	0.69	0.112	0.186	0.082	0.208	0.0238	0.1615	0.0489	0.114
36	0.0037	0.0210	0.75	0.170	0.150	0.050	0.420	0.0150	0.0200	0.0200	0.324

Table 3 (contd.)

SEASON=AUTUMN80

ID	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	0.0202	0.00462	0.001075	0.02785	0.0908	0.00792	0.00100	0.0674	0.00303	0.000069
2	0.0110	0.00500	0.000500	0.02439	0.0477	0.01100	0.00100	0.0265	0.00291	0.000400
3	0.0057	0.00337	0.002559	0.01348	0.0759	0.00420	0.00100	0.0466	0.00491	0.000485
4	0.0343	0.00670	0.001326	0.01565	0.0684	0.00845	0.00100	0.0517	0.00193	0.000400
5	0.0237	0.00502	0.001236	0.02190	0.0903	0.00794	0.00100	0.0649	0.00230	0.000320
7	0.0206	0.00253	0.000500	0.01106	0.0436	0.00841	0.00100	0.0175	0.00146	0.000153
8	0.0393	0.00517	0.001324	0.02502	0.0500	0.01035	0.00100	0.0667	0.00603	0.000151
9	0.0205	0.00526	0.000500	0.01330	0.0417	0.00771	0.00100	0.0368	0.00215	0.000132
10	0.0326	0.00500	0.000500	0.01400	0.0480	0.01000	0.00100	0.0460	0.00100	0.000300
11	0.0200	0.00593	0.001622	0.01780	0.1140	0.01470	0.00100	0.0764	0.00215	0.000277
13	0.0110	0.00532	0.000500	0.01733	0.0450	0.00765	0.00100	0.0725	0.00362	0.000233
14	0.0173	0.00366	0.003910	0.01460	0.1159	0.01092	0.00100	0.0766	0.00208	0.000312
15	0.0060	0.00500	0.003000	0.01623	0.0924	0.00849	0.00100	0.0591	0.00691	0.000300
16	0.0212	0.00995	0.001997	0.01280	0.0666	0.02898	0.00167	0.1384	0.00591	0.000100
17	0.0295	0.00387	0.000651	0.00485	0.0448	0.00826	0.00100	0.0215	0.00145	0.000540
18	0.0682	0.00600	0.002000	0.02238	0.1192	0.02100	0.00100	0.0658	0.00236	0.001300
19	0.0029	0.00155	0.000991	0.00548	0.0322	0.00697	0.00100	0.0439	0.00103	0.000066
20	0.0030	0.00143	0.004748	0.00547	0.0358	0.00813	0.00100	0.0309	0.00104	0.000078
21	0.0080	0.00415	0.000615	0.00390	0.0863	0.01253	0.00100	0.0555	0.00144	0.000169
22	0.0246	0.00400	0.003552	0.02871	0.0472	0.01102	0.00100	0.0344	0.01099	0.000400
23	0.0044	0.00285	0.001161	0.01309	0.0263	0.00845	0.00100	0.0244	0.00218	0.000218
24	0.0059	0.00198	0.000745	0.00361	0.0277	0.00598	0.00100	0.0189	0.00149	0.000320
25	0.0014	0.00163	0.003091	0.01046	0.0550	0.00635	0.00100	0.0268	0.00400	0.000226
26	0.0033	0.00136	0.002200	0.01278	0.0301	0.00473	0.00100	0.0173	0.00238	0.001083
27	0.0050	0.00327	0.002000	0.01172	0.0426	0.00363	0.00100	0.0685	0.00310	0.000050
28	0.0038	0.00179	0.000697	0.01543	0.0393	0.00258	0.00100	0.0261	0.00522	0.000109
30	0.0493	0.00300	0.000500	0.00234	0.1241	0.00100	0.00100	0.0677	0.00134	0.000100
31	0.0081	0.00224	0.000640	0.00360	0.0415	0.00240	0.00100	0.0331	0.00100	0.000050
35	0.0905	0.00100	0.002000	0.00348	0.0417	0.00100	0.00100	0.0310	0.00091	0.000050
36	0.0050	0.00100	0.000500	0.00345	0.0211	0.00200	0.00100	0.0406	0.00172	0.000050

Table 4:

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=WINTER80/81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.0660	0.1026	2.88	0.570	0.333	0.416	0.505	0.0871	0.0172	0.2097	0.315
2	0.0543	0.0993	3.90	0.766	0.798	0.483	0.660	0.1350	0.0346	0.2554	0.374
3	0.0621	0.1116	2.89	0.557	0.338	0.255	0.457	0.0661	0.0100	0.1200	0.317
4	0.0718	0.1029	3.88	0.587	0.397	0.316	0.556	0.0567	0.0100	0.1258	0.398
5	0.0331	0.0684	2.80	0.500	0.570	.	0.670	0.0750	.	.	0.380
7	0.0513	0.0897	2.57	0.600	0.337	0.265	0.608	0.0724	0.0207	0.1356	0.427
8	0.0512	0.0900	3.17	0.638	0.273	0.266	0.840	0.0831	0.0423	0.1357	0.648
9	0.0510	0.0803	2.04	0.498	0.094	0.131	0.400	0.0242	0.0157	0.0799	0.309
10	.	0.0336	4.26	0.826	.	0.800	0.480	.	0.0500	0.5300	0.405
11	0.0562	.	3.04	0.526	.	0.480	.	.	.	.	0.313
13	0.0545	0.0864	2.01	0.451	0.129	0.254	0.311	0.0151	0.0430	0.1467	0.210
14	0.0575	0.0956	1.96	0.481	0.110	0.446	0.302	0.0159	0.0145	0.2839	0.196
15	0.0457	0.0609	1.98	0.519	0.500	0.351	0.465	.	0.0193	0.2305	0.217
16	0.0500	0.0921	1.95	0.543	0.201	0.264	0.424	0.0191	0.0437	0.1659	0.251
17	0.0402	0.0881	1.02	0.389	0.085	0.111	0.213	0.0159	0.0119	0.0744	0.104
18	0.0515	0.0792	1.87	0.421	0.082	0.109	0.585	0.0103	0.0077	0.0561	0.235
19	0.0531	0.0834	1.45	0.474	0.044	0.110	0.188	0.0030	0.0090	0.0439	0.113
20	0.0569	0.0853	1.62	0.422	0.057	0.101	0.239	0.0092	0.0074	0.0443	0.146
21	0.0977	0.1282	2.94	0.685	0.176	0.500	0.500	0.0300	0.0398	0.3200	0.354
22	0.0397	0.0824	1.60	0.490	0.084	0.140	0.321	0.0221	0.0359	0.1424	0.161
23	0.0621	0.0751	2.28	0.451	0.170	0.073	0.395	0.0336	0.0100	0.0491	0.256
24	0.0476	0.0912	2.31	0.537	0.179	0.219	0.609	0.0400	0.0400	0.0700	0.272
25	0.0571	.	2.86	0.634	.	0.207	.	.	.	.	0.330
26	0.0441	0.0835	1.33	0.427	0.056	0.148	0.347	0.0080	0.0239	0.0596	0.164
27	0.0398	0.0752	2.00	0.504	0.152	0.140	0.496	0.0183	0.0079	0.0500	0.358
28	0.0191	0.0476	1.25	0.170	0.190	0.110	0.330	0.0200	0.0200	0.0400	0.142
30	0.0269	0.0580	1.91	0.353	0.060	0.207	0.160	0.0050	0.0050	0.0200	0.171
31	0.0327	0.1102	1.10	0.304	0.103	0.088	0.228	0.0138	0.0134	0.0625	0.154
35	0.0261	.	.	.	.	.	.	.	.	.	.
36	0.0146	0.0536	1.28	0.195	0.180	0.218	0.330	0.0300	0.0050	0.0700	0.133

Table 4 (contd.)

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=WINTER80/81

ID	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
	0.0091	0.00300	.	0.01551	0.0226	0.01100	0.00100	0.0231	0.00325	0.000400
1	0.0213	0.00500	0.001423	0.00417	0.0774	0.00862	0.00100	0.0757	0.00256	0.000204
2	0.0088	0.00876	0.000500	0.00789	0.0903	0.00946	0.00100	0.0990	0.00170	0.000185
3	0.0051	0.00385	0.000789	0.01271	0.0393	0.01169	0.00100	0.0697	0.00347	0.000862
4	0.0120	0.00600	0.002000	0.03163	0.0623	0.00800	0.00100	0.0443	0.00863	.
5	0.0098	0.00464	0.000736	0.00601	0.0763	0.01047	0.00100	0.0645	0.00475	0.000121
7	0.0050	0.00348	0.001000	0.01453	0.0299	0.01145	0.00100	0.0249	0.00436	0.000231
8	0.0095	0.00257	0.000571	0.00698	0.0158	0.00471	0.00100	0.0106	0.00259	0.000143
9	0.0040	.	0.001000	.	0.1303	0.02200	0.00100	0.0477	0.00379	0.000100
10	.	.	.	.	.	.	.	.	.	.
11	0.0046	0.00101	0.000500	0.00856	0.0155	0.00868	0.00100	0.0284	0.00157	0.000149
13	0.0034	0.00140	0.000800	0.00883	0.0280	0.00880	0.00100	0.0097	0.00169	0.000050
14	0.0033	0.00100	0.000693	0.02041	0.0465	0.00785	0.00100	0.0275	0.00314	0.000050
15	0.0054	0.00448	0.000500	0.01520	0.0434	0.00904	0.00100	0.0082	0.00365	0.000200
16	0.0025	0.00200	0.000500	0.00935	0.0198	0.00500	0.00100	0.0177	0.00245	0.000200
17										
18	0.0042	0.00178	0.002000	0.01258	0.0447	0.00511	0.00100	0.0081	0.00664	0.000076
19	0.0038	0.00100	0.000500	0.00741	0.0125	0.00300	0.00100	0.0060	0.00132	0.000050
20	0.0019	0.00118	0.000853	0.00954	0.0169	0.00508	0.00100	0.0170	0.00122	0.000056
21	0.0080	0.00050	0.000500	0.00198	0.0040	0.00100	0.00100	0.0050	0.00344	0.000050
22	0.0037	0.00177	0.001844	0.01104	0.0429	0.00700	0.00100	0.0084	0.00465	0.000200
23	0.0031	0.00191	0.000773	0.02428	0.0834	0.00427	0.00100	0.0101	0.00398	0.000077
24	0.0110	0.00300	0.000500	0.01915	0.0281	0.00800	0.00100	0.0450	0.00454	0.000050
25	.	.	.	.	.	.	.	.	.	.
26	0.0024	0.00200	0.002000	0.02514	0.0679	0.00500	0.00100	0.0079	0.00657	0.000200
27	0.0032	0.00200	0.000500	0.00660	0.0164	0.00500	0.00100	0.0119	0.00730	0.000100
28	0.0030	0.00300	0.000500	0.00900	0.0160	0.00200	0.00100	0.0130	0.00400	0.000050
30	0.0020	0.00100	0.000500	0.01053	0.0516	0.00400	0.00100	0.0094	0.00334	0.000050
31	0.0033	0.00137	0.000500	0.01677	0.0535	0.00410	0.00100	0.0234	0.00463	0.000068
35	.	.	.	.	.	.	.	.	.	.
36	0.0120	.	.	.	.	.	.	.	.	.

Table 5:

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=SPRING81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.0899	0.1357	6.41	0.778	0.643	0.364	0.901	0.1589	0.0576	0.1373	0.834
2	0.0881	0.1261	6.46	0.916	0.797	0.319	1.046	0.1511	0.1020	0.1415	0.902
3	0.1072	0.1654	6.92	0.997	0.820	0.337	1.373	0.2167	0.1272	0.1594	1.146
4	0.0355	0.0814	6.19	0.914	.	0.374	1.177	0.1800	0.0707	0.1300	0.866
5	0.0643	0.1096	5.12	0.821	0.468	0.490	1.096	0.1253	0.0810	0.1426	0.859
7	0.0703	0.0881	5.32	0.695	0.670	0.250	1.036	0.1934	0.0675	0.1200	0.871
8	0.0569	0.0960	5.59	0.787	0.646	0.241	1.211	0.1565	0.0520	0.0871	1.055
9	0.0479	0.0528	4.74	0.772	0.415	0.302	1.000	0.0942	0.1000	0.1311	0.630
10	0.0871	0.0707	6.62	0.850	0.700	0.463	1.486	0.2100	0.0932	0.1813	1.058
11	0.0119	0.0421	5.37	0.789	.	0.358	1.317	0.1615	0.0889	0.2057	0.895
13	0.0458	0.0860	4.68	0.694	0.905	0.327	0.976	0.1110	0.0558	0.1448	0.745
14	0.0303	0.0566	4.27	0.607	0.770	0.346	0.559	0.1000	0.1196	0.2592	0.513
15	0.0383	0.0801	3.65	0.614	0.975	0.234	1.072	0.2600	0.0564	0.1257	0.559
16	0.0603	0.0856	4.40	0.651	0.509	0.253	0.784	0.0791	0.0461	0.1158	0.562
17	0.0612	0.1040	4.40	0.644	0.582	0.440	0.942	0.0937	0.1845	0.1201	0.500
18	0.0688	0.1073	4.48	0.631	0.416	0.225	0.970	0.0670	0.0881	0.1070	0.660
19	0.0532	0.0878	3.70	0.502	0.368	0.165	0.818	0.0589	0.0726	0.0736	0.543
20	0.0595	0.1112	4.77	0.651	0.499	0.170	0.739	0.0821	0.0349	0.0810	0.585
21	0.0297	0.0653	3.52	0.496	0.560	0.372	0.846	0.0970	0.0676	0.1889	0.576
22	0.0361	0.0698	2.98	0.423	0.456	0.156	0.570	0.0741	0.0611	0.0986	0.414
23	0.0565	0.0949	4.51	0.646	0.624	0.202	0.989	0.1044	0.0609	0.1007	0.785
24	0.0364	0.0690	3.50	0.396	0.447	0.187	0.671	0.0726	0.0566	0.1056	0.544
25	0.0337	0.0673	3.03	0.328	0.480	0.133	0.747	0.0716	0.0558	0.0934	0.561
26	0.0316	0.0630	2.82	0.375	0.414	0.112	0.616	0.0612	0.0778	0.0597	0.457
27	0.0468	0.0788	2.38	0.233	0.070	0.069	0.270	0.0250	0.0300	0.0200	0.250
28	.	0.0315	1.87	0.211	0.930	0.344	0.530	.	0.0454	0.2027	0.767
30	.	0.0281	3.19	0.443	0.780	0.212	0.672	0.1550	0.0650	0.0920	0.448
31	0.0362	0.0751	2.85	0.546	0.372	0.091	0.840	0.0546	0.0585	0.0501	0.665
35	.	0.0334	2.83	0.502	.	0.384	1.350	0.3698	0.1400	0.2200	0.740
36	0.0004	0.0293	1.40	0.273	0.470	0.171	0.515	0.1100	0.1201	0.0900	0.315

Table 5 (contd.)

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=SPRING81

ID	PP04	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	0.0165	0.00600	0.000500	0.01284	0.1181	0.01078	0.00100	0.0979	0.00996	0.000088
2	0.0149	0.00563	0.000500	0.00955	0.1101	0.00622	0.00100	0.1020	0.00642	0.000200
3	0.0308	0.01200	0.001208	0.02298	.	0.01268	0.00100	0.4930	0.00939	0.000528
4	0.0423	0.00877	0.000500	0.01107	0.1191	0.01000	0.00100	0.1016	0.01249	0.000300
5	0.0277	0.00619	0.001059	0.01667	0.1156	0.00778	0.00121	0.0849	0.00846	0.000375
7	0.0720	0.00463	0.000500	0.00879	0.0910	0.00585	0.00100	0.1096	0.00582	0.000174
8	0.0171	0.00489	0.000500	0.00758	0.0767	0.00517	0.00100	0.0848	0.00614	0.000147
9	0.0230	0.00489	0.000500	0.00953	0.0970	0.00273	0.00100	0.0616	0.00382	0.000142
10	0.0575	0.00900	0.001502	0.02053	0.1930	0.02719	0.00220	.	.	0.000200
11	0.0516	0.00902	0.000500	0.01074	0.1102	0.00498	0.00100	0.0964	0.00904	0.000281
13	0.0193	0.00878	0.000699	0.01319	0.1577	0.00759	0.00140	0.1569	0.00948	0.000177
14	0.0143	0.00800	0.000500	0.01151	0.1730	0.00500	0.00100	0.1595	0.01603	0.000300
15	0.0227	0.01007	0.000500	0.01743	0.1197	0.00955	0.00100	0.1281	0.00756	0.000050
16	0.0311	0.00577	0.000500	0.01022	0.1645	0.00867	0.00100	0.1319	0.00885	0.000398
17	0.0338	0.00819	0.000500	0.00753	0.2239	0.00924	0.00137	0.2023	0.00560	0.000553
18	0.0371	0.00457	0.000716	0.01743	0.1210	0.00654	0.00100	0.0637	0.00580	0.007984
19	0.0228	0.00604	0.000500	0.00603	0.2510	0.00617	0.00100	0.3463	0.00793	0.000240
20	0.0102	0.00675	0.000627	0.00950	0.1721	0.00666	0.00100	0.1428	0.00307	0.000132
21	0.0316	0.01016	0.001920	0.02091	0.1714	0.00576	0.00128	0.1091	0.00485	0.000456
22	0.0127	0.00888	0.003261	0.02834	0.1437	0.00509	0.00100	0.1332	0.00220	0.000218
23	0.0106	0.01499	0.002997	0.02348	.	0.01100	0.00100	0.6361	0.00743	0.000350
24	0.0134	0.01162	0.001781	0.02496	0.3389	0.00795	0.00100	0.3426	0.00261	0.000295
25	0.0384	0.00937	0.001255	0.01778	0.1658	0.00603	0.00100	0.1426	0.00360	0.000552
26	0.0172	0.00923	0.001101	0.01602	0.1507	0.00453	0.00244	0.1719	0.00490	0.000086
27	0.0120	0.00300	0.001000	0.03122	0.0295	0.00400	0.00100	0.0288	0.00132	0.000050
28	0.0100	.	.	.	.	.	.	.	.	.
30	0.0215	0.02104	0.000500	0.01111	0.1670	0.00363	0.00141	0.1230	0.01371	0.000100
31	0.0449	0.00344	0.000500	0.01199	0.1235	0.00369	0.00100	0.1236	0.01141	0.000064
35	0.0430	0.09500	0.002000	0.02400	.	0.00800	0.00500	.	0.02367	0.000100
36	0.0377	0.01400	0.000500	0.00366	.	0.00100	0.00100	.	0.01650	0.000200

Table 6:

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=SUMMER81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.1051	0.1403	6.54	0.694	0.310	0.235	0.686	0.0786	0.0517	0.0459	0.576
2	0.0846	0.1169	4.88	0.556	0.293	0.162	0.653	0.0635	0.0517	0.0320	0.533
3	0.0894	0.1214	4.87	0.621	0.356	0.169	0.777	0.0635	0.0417	0.0479	0.572
4	0.0923	0.1011	6.61	0.786	0.700	0.252	0.885	0.1120	0.0569	0.0573	0.944
5	0.0888	0.1215	5.30	0.672	0.656	0.207	0.738	0.1193	0.0639	0.0359	0.607
7	0.1064	0.1218	4.81	0.747	0.503	0.190	0.710	0.0674	0.1871	0.0395	0.560
8	0.0521	0.0935	3.23	0.536	0.247	0.258	0.887	0.1320	0.0881	0.1639	0.680
9	0.0872	0.1177	4.66	0.519	0.236	0.139	0.649	0.0525	0.0284	0.0309	0.498
10	0.0713	0.1070	5.78	0.627	0.483	0.165	0.900	0.0650	0.0400	0.0795	0.894
11	0.0829	0.1129	5.20	0.572	0.641	0.133	0.741	0.0550	0.0332	0.0133	0.552
13	0.0596	0.1144	5.05	0.601	0.506	0.164	0.914	0.0702	0.0694	0.0445	0.571
14	0.0823	0.1212	5.09	0.541	0.297	0.134	0.878	0.0478	0.0823	0.0641	0.679
15	0.0346	0.0625	4.76	0.492	0.680	0.151	0.649	.	0.0599	0.0763	0.507
16	0.0933	0.1007	4.86	0.407	0.281	0.206	0.919	0.0453	0.1000	0.0900	0.232
17	0.0856	0.1255	4.99	0.444	0.300	0.140	0.489	0.0636	0.1536	0.0976	0.542
18	0.0732	0.1070	4.33	0.451	0.222	0.125	0.495	0.0364	0.1539	0.0263	0.557
19	0.0909	0.1031	3.92	0.342	0.125	0.116	0.476	0.0177	0.1178	0.0188	0.329
20	0.0850	0.1198	4.69	0.504	0.249	0.170	0.580	0.0412	0.0823	0.0351	0.472
21	0.0788	0.1204	4.50	0.520	0.274	0.134	0.780	0.0690	0.0421	0.0462	0.710
22	0.0719	0.1056	3.99	0.355	0.175	0.186	0.485	0.0301	0.0969	0.0367	0.347
23	0.0924	0.1308	5.59	0.624	0.332	0.120	1.100	0.0635	0.0921	0.0200	0.695
24	0.0418	0.0887	3.58	0.330	0.107	0.096	1.013	0.0495	0.1016	0.0400	0.517
25	0.0434	0.0886	4.70	0.307	0.143	0.089	0.571	0.0315	0.1916	0.0329	0.425
26	0.0618	0.0942	2.97	0.284	0.160	0.073	0.501	0.0317	0.0546	0.0323	0.344
27	0.0191	0.0428	1.62	0.195	0.277	0.060	0.624	0.1110	0.0865	0.0185	0.363
28	0.0359	0.0332	0.94	0.100	0.469	0.049	0.379	0.0820	0.0323	0.0229	0.190
30	.	0.0377	1.24	0.162	0.567	0.086	0.662	0.1129	0.1347	0.0260	0.344
31	0.0232	0.0525	1.35	0.181	0.190	0.079	0.420	0.0291	0.0481	0.0594	0.162
35	0.0047	0.0388	0.93	0.216	0.172	0.104	0.690	0.0270	0.0660	0.0160	0.435
36	0.0066	0.0800	1.10	0.137	0.334	0.178	0.558	0.0500	0.1400	0.0400	0.210

Table 6 (contd.)

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=SUMMER81

ID	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	0.0158	0.00471	0.000500	0.00918	0.0682	0.00918	0.00100	0.0610	0.00277	0.000120
2	0.0072	0.00305	0.001254	0.00673	0.0455	0.00686	0.00100	0.0352	0.00137	0.000093
3	0.0208	0.00454	0.000500	0.01040	0.0547	0.00751	0.00100	0.0379	0.00347	0.000275
4	0.0098	0.00649	0.000500	0.00802	0.0659	0.00971	0.00100	0.0470	0.00147	0.000261
5	0.0144	0.00537	0.000816	0.01011	0.0631	0.00930	0.00100	0.0597	0.00190	0.000273
7	0.0110	0.00586	0.001255	0.00945	0.0672	0.00931	0.00100	0.0540	0.00311	0.000148
8	0.0176	0.00468	0.002377	0.02212	0.0633	0.01020	0.00100	0.0377	0.00121	0.000050
9	0.0110	0.00292	0.001254	0.00459	0.0322	0.00576	0.00100	0.0225	0.00115	0.000117
10	0.0250	0.00520	0.000610	0.00921	0.0469	0.00978	0.00100	0.0383	0.00166	0.000129
11	0.0113	0.00400	0.000500	0.00781	0.0488	0.00838	0.00100	0.0382	0.00166	0.000122
13	0.0222	0.00349	0.000500	0.00586	0.0602	0.00709	0.00100	0.0465	0.00217	0.000050
14	0.0528	0.00300	0.000500	0.00864	0.0349	0.00924	0.00100	0.0269	0.00216	0.000100
15	0.0241	0.00642	0.001453	0.00966	0.0567	0.00873	0.00100	0.0323	0.00103	0.000100
16	0.0745	0.00249	0.000500	0.00573	0.0191	0.01287	0.00100	0.0204	0.00140	0.000099
17	0.0727	0.00178	0.000500	0.00629	0.0232	0.00844	0.00100	0.0107	0.00094	0.000100
18	0.0085	0.00530	0.001120	0.01211	0.0893	0.01621	0.00100	0.0341	0.00252	0.000178
19	0.0440	0.00256	0.000500	0.01418	0.0263	0.00545	0.00100	0.0157	0.00138	0.000075
20	0.0122	0.00489	0.000698	0.00652	0.0727	0.00660	0.00100	0.0262	0.00121	0.000332
21	0.0184	0.00300	0.000500	0.01085	0.0589	0.00600	0.00100	0.0771	0.00802	0.000100
22	0.0161	0.00427	0.000930	0.00466	0.0988	0.00758	0.00100	0.1117	0.00255	0.000289
23	0.0271	0.00441	0.001353	0.00979	0.0357	0.00671	0.00100	0.0203	0.00229	0.000135
24	0.1154	0.00513	0.001123	0.01252	0.0916	0.00445	0.00100	0.0259	0.00220	0.000115
25	0.1401	0.00383	0.000655	0.00836	0.0462	0.00805	0.00100	0.0319	0.00289	0.000308
26	0.0270	0.00300	0.000500	0.00619	0.0216	0.00599	0.00100	0.0252	0.00209	0.000106
27	0.0374	0.00386	0.000500	0.00617	0.0283	0.00357	0.00100	0.0249	0.00588	0.000071
28	0.0069	0.00272	0.001381	0.00816	0.0386	0.00488	0.00100	0.0264	0.00894	0.000189
30	0.0403	0.00457	0.000500	0.00484	0.0300	0.00406	0.00100	0.0228	0.00120	0.000062
31	0.0214	0.00200	0.000500	0.00718	0.0115	0.00300	0.00100	0.0087	0.00108	0.000060
35	0.0430	0.00700	0.000500	0.01150	.	0.01000	0.00100	.	0.00375	0.000100
36	0.0310	0.00400	0.000500	0.00400	0.1330	0.00200	0.00100	0.0320	0.00100	0.000050

Table 7:

SEASONAL GAUGE DEPTH WEIGHTED MEAN CONCENTRATION(MG/L)

SEASON=AUTUMN81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4
1	0.0809	0.1144	4.86	0.563	0.527	0.119	0.526	0.1120	0.1218	0.0417	0.404
2	0.0664	0.0974	4.09	0.519	0.420	0.130	0.581	0.0660	0.0642	0.0333	0.471
3	0.0795	0.1096	3.76	0.545	0.299	0.088	0.444	0.0395	0.0338	0.0281	0.372
4	0.0418	0.0810	4.61	0.570	0.643	0.203	0.962	0.0723	0.0841	0.0536	0.744
5	0.0506	0.0820	2.99	0.439	0.277	0.068	0.439	0.0393	0.0279	0.0342	0.315
6	0.0407	0.0754	2.50	0.400	0.240	0.080	0.370	0.0250	0.0200	0.0200	0.356
7	0.0132	0.0458	2.97	0.456	0.790	0.177	0.750	0.2400	0.0400	0.0800	0.600
8	0.0437	0.0767	3.09	0.395	0.413	0.077	0.516	0.0804	0.0451	0.0325	0.441
9	0.0481	0.0861	3.03	0.408	0.296	0.072	0.512	0.0573	0.0422	0.0441	0.358
10	0.0591	0.0839	3.34	0.495	0.532	0.226	0.644	0.1400	0.0200	0.0694	0.468
11	0.0719	0.1060	3.69	0.486	0.282	0.081	0.438	0.0353	0.0238	0.0169	0.354
12	0.0597	0.0890	2.59	0.352	0.196	0.071	0.284	0.0154	0.0427	0.0301	0.217
13	0.0661	0.0991	3.73	0.561	0.238	0.115	0.654	0.0225	0.0506	0.0385	0.567
14	0.0777	0.1064	3.39	0.519	0.161	0.106	0.413	0.0296	0.0667	0.0477	0.367
15	0.0348	0.0698	2.88	0.428	0.466	0.085	0.829	0.1107	0.0437	0.0243	0.308
16	0.0530	0.0847	2.57	0.435	0.353	0.100	0.325	0.0284	0.0398	0.0441	0.271
17	0.0654	0.0980	2.85	0.382	0.082	0.051	0.338	0.0174	0.0218	0.0254	0.238
18	0.0582	0.0936	3.46	0.452	0.153	0.090	0.296	0.0210	0.1872	0.0289	0.232
19	0.0459	0.0802	2.25	0.296	0.081	0.042	0.349	0.0053	0.0176	0.0238	0.232
20	0.0541	0.0921	3.24	0.421	0.185	0.083	0.528	0.0281	0.0289	0.0382	0.418
21	0.0627	0.0945	2.60	0.409	0.152	0.027	0.367	0.0265	0.1388	0.0143	0.246
22	0.0472	0.0768	1.93	0.274	0.097	0.049	0.244	0.0050	0.0293	0.0269	0.198
23	0.0609	0.0981	2.87	0.406	0.096	0.038	0.377	0.0100	0.0199	0.0250	0.310
24	0.0488	0.0793	2.41	0.262	0.095	0.039	0.181	0.0113	0.0274	0.0170	0.135
25	0.0439	0.0936	1.77	0.190	0.060	0.031	0.341	0.0078	0.0154	0.0480	0.126
26	0.0304	0.0611	1.36	0.171	0.109	0.029	0.169	0.0082	0.0365	0.0331	0.091
27	0.0275	0.0475	1.62	0.179	0.054	0.083	0.240	0.0050	0.1376	0.0635	0.382
28	0.0389	0.0418	2.75	0.450	0.440	.	0.550	0.1400	0.0800	.	0.410
30	.	0.0295	1.76	0.313	0.800	0.132	0.316	0.1700	0.0232	0.0310	0.232
31	0.0325	0.0654	1.60	0.284	0.094	0.030	0.282	0.0122	0.0176	0.0336	0.216
34	0.0306	0.0627	1.84	0.366	0.195	0.020	0.487	0.0238	0.0200	0.0246	0.426
35	0.0114	0.0447	1.05	0.155	0.129	0.069	0.312	0.0181	0.0706	0.0486	0.228
36	0.0049	0.0331	1.13	0.188	0.386	0.045	0.264	0.0696	0.0513	0.0347	0.175

Table 7 (contd.)

-- SEASON=AUTUMN81 --

ID	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	0.0329	0.00501	0.000637	0.01521	0.0546	0.01383	0.00100	0.0327	0.00269	0.000246
2	0.0325	0.00350	0.001604	0.00782	0.0462	0.00997	0.00100	0.0320	0.00369	0.000241
3	0.0110	0.00290	0.000500	0.00758	0.0358	0.00963	0.00100	0.0265	0.00307	0.000094
4	0.0577	0.00413	0.000500	0.00927	0.0390	0.00862	0.00100	0.0314	0.00155	0.000105
5	0.0144	0.00255	0.000500	0.00571	0.0299	0.00679	0.00100	0.0152	0.00165	0.000165
6	0.0080	0.00200	0.000500	0.00637	0.0286	0.00700	0.00100	.	0.01150	0.000100
7	0.0200	0.00700	0.000500	0.02389	0.0818	0.00994	0.00100	0.0391	0.00813	0.000762
8	0.0146	0.00314	0.000500	0.01204	0.0359	0.00636	0.00100	0.0341	0.00518	0.000315
9	0.0211	0.00214	0.000500	0.01511	0.0545	0.01369	0.00100	0.0438	0.00496	0.000612
10	0.0276	0.00300	0.000670	0.01220	0.0527	0.01625	0.00100	0.0369	0.00386	0.000719
11	0.0129	0.00238	0.000845	0.00576	0.0288	0.00807	0.00100	0.0137	0.00294	0.000154
12	0.0138	0.00169	0.000649	0.00875	0.0234	0.00621	0.00100	0.0144	0.00195	0.000260
13	0.0538	0.00307	0.000766	0.00820	0.0284	0.00947	0.00100	0.0144	0.00466	0.000077
14	0.0248	0.00255	0.000500	0.00576	0.0173	0.00879	0.00100	0.0136	0.00265	0.000078
15	0.0668	0.00391	0.000500	0.00788	0.0506	0.00780	0.00100	0.0292	0.00498	0.000116
16	0.0190	0.00371	0.000810	0.01082	0.0333	0.00648	0.00100	0.0114	0.00448	0.000414
17	0.0308	0.00248	0.000590	0.00906	0.0143	0.00730	0.00100	0.0055	0.00426	0.000107
18	0.0118	0.00177	0.000500	0.00534	0.0170	0.00749	0.00100	0.0100	0.00221	0.000300
19	0.0143	0.00157	0.001158	0.00473	0.0199	0.00564	0.00100	0.0107	0.00226	0.000247
20	0.0218	0.00339	0.000500	0.00364	0.0291	0.00570	0.00100	0.0211	0.00186	0.000085
21	0.0074	0.00213	0.000500	0.00677	0.0231	0.00526	0.00100	0.0113	0.00467	0.000202
22	0.0103	0.00200	0.000500	0.00329	0.0471	0.00455	0.00100	0.0092	0.00216	0.000127
23	0.0118	0.00150	0.000500	0.00724	0.0206	0.00645	0.00100	0.0062	0.00320	0.000171
24	0.0215	0.00432	0.000500	0.00939	0.0229	0.00408	0.00100	0.0094	0.00504	0.000301
25	0.0221	0.00260	0.000500	0.01671	0.0366	0.00379	0.00100	0.0106	0.00174	0.000160
26	0.0120	0.00206	0.000500	0.00733	0.0191	0.00304	0.00100	0.0049	0.00286	0.000093
27	0.0763	0.00079	0.000500	0.00619	0.0149	0.00159	0.00100	0.0065	0.00102	0.000610
28	0.0070	.	.	.	.	.	.	.	.	.
30	0.0328	0.00587	0.000500	0.00952	0.1874	0.00393	0.00100	0.0772	0.00300	0.000161
31	0.0220	0.00114	0.000500	0.00701	0.0176	0.00634	0.00100	0.0116	0.00197	0.000154
34	0.0146	0.00292	0.000500	0.00920	0.0456	0.00516	0.00100	0.0211	0.00628	0.000146
35	0.0613	0.00200	0.005857	0.00424	0.0421	0.00386	0.00100	0.0377	0.00454	0.000086
36	0.0407	0.00468	0.000500	0.00569	0.0719	0.00378	0.00100	0.0886	0.00382	0.000103

Table 8:

SEASONAL DEPOSITION (MG/M**2)

SEASON=AUTUMN80

ID	HF	HT	SO4	NO3	CA	CL	NTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PH	V	AL	CU	CD
1	5.57	10.36	525	82.9	77.5	30.40	128.9	17.82	7.40	7.36	93.4	2.16	0.501	0.117	3.025	9.86	0.860	0.109	7.32	0.329	0.008
2	7.47	12.67	452	93.9	107.8	32.83	146.8	19.93	8.87	8.06	99.4	1.80	0.817	0.082	3.983	7.79	1.797	0.163	4.33	0.475	0.065
3	9.01	22.07	991	169.0	191.1	70.04	169.7	33.77	13.09	20.58	127.8	1.55	0.914	0.694	3.963	20.57	1.139	0.271	12.64	1.331	0.131
4	14.34	16.83	781	115.4	122.4	53.53	177.7	21.84	11.78	11.90	138.2	5.25	1.350	0.267	3.156	13.79	1.704	0.202	10.42	0.389	0.081
5	13.39	19.17	859	127.5	119.4	56.01	187.5	19.68	22.84	11.15	118.3	3.56	1.151	0.284	5.024	20.71	1.822	0.229	14.88	0.527	0.073
7	8.27	14.87	609	109.7	82.4	45.66	185.1	16.42	10.01	9.18	120.1	3.73	0.572	0.113	2.498	9.86	1.899	0.226	3.96	0.331	0.035
8	3.95	15.23	1085	159.5	179.2	71.52	338.5	37.08	20.44	13.89	237.6	10.35	1.360	0.349	6.586	13.15	2.725	0.263	17.55	1.587	0.040
9	8.35	18.31	708	143.2	120.2	23.61	230.0	18.55	8.02	12.80	156.0	4.89	1.257	0.120	3.179	9.98	1.844	0.239	8.80	0.515	0.032
10	0.00	11.24	888	123.0	97.5	57.10	197.7	.	16.66	0.35	167.1	4.84	0.706	0.071	1.978	6.78	1.413	0.141	6.50	0.141	0.042
11	9.85	17.74	722	149.1	150.7	42.52	227.5	17.94	19.00	13.32	145.9	4.23	1.256	0.343	3.768	24.14	3.112	0.212	16.17	0.455	0.059
13	7.83	15.78	591	152.4	117.4	66.06	157.9	18.08	29.91	33.84	86.4	2.59	1.255	0.118	4.086	10.61	1.804	0.236	17.11	0.854	0.055
14	18.20	27.89	807	151.7	71.5	36.84	202.0	10.04	6.86	12.73	106.9	4.87	1.031	1.102	4.114	32.66	3.077	0.282	21.57	0.586	0.088
15	24.64	20.12	989	129.3	79.2	40.92	155.3	21.12	17.76	21.90	108.4	1.63	1.320	0.810	4.382	24.95	2.292	0.270	15.95	1.866	0.081
16	15.14	25.26	960	173.0	165.5	60.59	220.3	25.34	35.37	30.78	123.7	5.99	2.811	0.564	3.622	18.84	8.191	0.471	39.12	1.673	0.028
17	17.98	21.73	680	111.7	46.0	41.57	175.6	17.59	40.24	22.13	90.7	7.83	1.030	0.173	1.290	11.92	2.195	0.266	5.72	0.387	0.144
18	15.43	21.41	889	148.0	68.6	93.65	204.8	15.37	49.49	4.15	141.1	19.66	1.227	0.409	4.578	24.38	4.295	0.205	13.47	0.484	0.266
19	9.95	17.28	518	76.5	28.7	8.63	114.4	3.83	4.22	1.57	95.3	0.68	0.366	0.235	1.300	7.64	1.652	0.237	10.40	0.245	0.016
20	9.70	22.18	589	89.4	70.2	29.24	136.1	8.88	15.33	1.54	97.9	0.73	0.307	1.018	1.174	7.68	1.744	0.214	6.63	0.223	0.017
21	40.90	42.08	1659	232.7	196.2	45.25	253.5	24.02	12.71	18.16	189.4	3.16	1.640	0.243	1.543	34.11	4.953	0.395	21.95	0.571	0.067
22	12.94	33.84	518	113.4	31.9	25.20	296.4	5.88	11.76	8.40	114.6	9.24	1.499	1.331	10.762	17.69	4.130	0.375	12.90	4.119	0.150
23	12.80	19.84	620	104.5	62.6	20.07	110.3	7.29	10.34	9.31	83.0	0.90	0.584	0.238	2.684	5.39	1.733	0.205	5.00	0.448	0.045
24	11.52	18.29	479	68.0	36.9	9.85	65.4	3.08	7.38	7.38	47.8	1.47	0.490	0.184	0.893	6.86	1.480	0.247	4.69	0.370	0.079
25	11.10	16.76	454	54.4	34.8	8.30	51.6	3.20	3.81	5.28	43.5	0.28	0.322	0.609	2.060	10.83	1.250	0.197	5.28	0.788	0.045
26	6.28	12.17	399	45.3	40.3	21.39	81.0	5.07	4.68	7.80	50.6	0.63	0.258	0.418	2.427	5.73	0.898	0.190	3.29	0.453	0.206
27	1.21	7.11	412	53.7	43.0	12.21	54.7	7.48	11.13	5.91	35.5	0.48	0.588	0.360	2.110	7.66	0.654	0.180	12.33	0.559	0.009
28	6.01	15.00	468	48.4	264.7	.	175.3	19.02	13.55	.	107.8	1.52	0.714	0.278	6.162	15.70	1.030	0.399	10.43	2.083	0.044
30	0.00	5.43	140	22.5	128.8	13.88	71.8	.	12.11	7.56	26.5	7.06	0.616	0.103	0.482	25.50	0.205	0.205	13.91	0.276	0.021
31	6.63	14.55	365	68.0	62.1	17.88	93.7	9.12	6.18	6.62	69.7	2.22	0.615	0.176	0.987	11.38	0.658	0.274	9.09	0.276	0.014
35	0.43	7.33	106	17.2	28.8	12.67	15.0	3.68	28.90	8.75	8.3	13.98	0.319	0.638	1.111	13.30	0.319	0.319	9.90	0.292	0.016
36	1.41	7.98	285	64.6	57.0	18.99	159.5	5.70	7.60	7.60	123.1	1.90	0.380	0.190	1.310	8.00	0.760	0.380	15.41	0.655	0.019

Table 9:

SEASONAL DEPOSITION (MG/M**2)

SEASON=WINTER80/81

ID	HF	HT	SO4	NNO3	CA	CL	VTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	9.11	14.16	397	78.6	45.9	57.35	69.7	12.02	2.38	27.04	43.4	1.26	0.585	0.000	3.024	4.41	2.145	0.195	4.51	0.615	0.078
2	7.76	19.36	558	109.5	155.7	69.12	128.7	20.25	6.75	49.80	72.9	4.15	0.750	0.277	0.812	15.09	1.680	0.195	11.36	0.500	0.040
3	9.13	16.40	425	81.9	49.6	37.54	67.1	9.71	1.59	17.64	46.5	1.29	1.287	0.073	1.160	13.28	1.390	0.147	14.55	0.250	0.027
4	10.27	18.99	555	108.2	73.3	58.32	102.7	10.46	1.84	23.20	73.4	0.94	0.709	0.145	2.344	7.26	2.157	0.184	12.86	0.640	0.159
5	8.58	17.73	726	129.6	147.7	0.00	173.6	19.44	.	.	98.5	3.11	1.555	0.518	8.198	16.16	2.073	0.259	11.49	2.238	.
7	9.07	15.88	454	106.2	59.6	46.85	107.6	12.82	3.67	24.01	75.6	1.74	1.081	0.172	1.402	17.78	2.441	0.233	15.04	1.108	0.028
8	9.37	21.47	580	116.7	50.0	48.71	200.4	15.21	7.75	24.84	118.5	1.20	0.831	0.238	3.465	7.13	2.731	0.238	5.95	1.039	0.055
9	10.25	16.13	409	100.1	18.9	26.37	80.4	4.87	3.15	16.05	62.1	1.91	0.516	0.115	1.404	3.18	0.946	0.201	2.14	0.520	0.029
10	.	7.30	571	110.8	.	173.88	104.3	.	10.87	115.20	54.4	0.87	0.000	0.217	0.000	28.32	4.782	0.217	10.37	0.823	0.022
11	3.67	.	582	100.7	.	152.58	.	.	.	.	60.0	.	.	.	.	.	.	.	.	.	.
13	13.06	30.55	483	108.1	31.0	60.86	74.6	3.62	10.31	35.16	50.3	1.11	0.358	0.177	3.027	5.49	3.070	0.354	10.05	0.556	0.053
14	12.85	21.36	438	107.4	24.6	99.72	67.4	3.56	3.23	63.42	43.7	0.77	0.432	0.247	2.724	8.62	2.714	0.308	2.98	0.520	0.015
15	7.18	13.76	322	84.4	81.3	55.06	75.6	.	3.02	36.16	35.3	0.53	0.277	0.156	4.607	10.49	1.773	0.226	6.21	0.708	0.011
16	11.44	21.06	445	124.3	45.9	60.42	96.9	4.37	10.00	37.93	57.3	1.24	1.394	0.156	4.731	13.50	2.814	0.311	2.54	1.184	0.065
17	6.96	14.57	177	67.3	14.0	19.23	35.2	2.63	1.96	12.30	18.0	0.42	0.538	0.134	2.514	5.32	1.344	0.269	4.77	0.657	0.054
18	12.41	19.08	451	101.4	19.8	26.19	141.0	2.48	1.86	13.53	56.7	1.01	0.604	0.696	4.151	15.16	1.731	0.339	2.76	2.251	0.026
19	9.31	14.64	254	83.2	7.7	19.27	32.9	0.52	1.58	7.71	19.8	0.66	0.282	0.141	2.090	3.52	0.846	0.282	1.70	0.374	0.014
20	12.40	18.59	354	92.0	12.4	22.06	52.1	2.01	1.62	9.66	31.8	0.42	0.258	0.186	2.081	3.69	1.108	0.218	3.71	0.267	0.012
21	22.57	29.61	473	110.2	28.3	45.48	115.5	2.73	6.40	29.11	57.0	1.85	0.115	0.115	0.457	0.91	0.231	0.231	1.14	0.795	0.012
22	5.28	13.84	212	65.1	11.1	18.61	54.0	2.93	4.78	18.94	21.5	0.62	0.297	0.310	1.855	7.21	1.176	0.168	1.74	0.781	0.034
23	8.14	11.15	299	67.0	22.3	10.81	58.7	4.40	1.49	7.29	33.6	0.46	0.284	0.115	3.607	12.39	0.635	0.149	1.50	0.591	0.011
24	4.57	14.23	222	51.6	17.2	21.06	58.4	1.44	6.24	10.92	26.1	0.40	0.468	0.078	2.987	4.38	1.248	0.156	7.02	0.708	0.008
25	4.11	.	206	45.6	.	12.72	.	.	.	.	23.8	.	.	.	.	.	.	.	.	.	.
26	5.23	9.89	158	50.6	6.6	17.52	41.1	0.95	2.83	7.06	19.4	0.28	0.186	0.186	2.338	6.31	0.465	0.093	0.73	0.611	0.019
27	3.18	6.77	160	40.3	13.6	11.20	44.6	1.65	0.71	4.50	28.6	0.28	0.210	0.052	0.693	1.73	0.525	0.105	1.25	0.766	0.010
28	2.79	6.97	183	24.9	27.8	16.10	48.3	2.93	2.93	5.85	20.8	0.44	0.439	0.073	1.317	2.34	0.293	0.146	1.90	0.585	0.007
30	2.69	10.49	255	47.1	10.9	27.58	28.9	0.90	0.90	3.62	22.8	0.36	0.181	0.090	1.905	9.33	0.724	0.181	1.70	0.605	0.009
31	2.99	10.06	101	27.8	9.4	8.01	29.0	1.26	1.22	5.71	14.0	0.42	0.174	0.064	2.135	6.82	0.522	0.127	2.99	0.590	0.009
35	1.76	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
36	0.89	2.88	78	11.9	9.7	13.25	17.7	1.61	0.27	3.76	5.6	0.64	.	.	.	.	.	.	.	.	.

Table 10:

SEASONAL DEPOSITION (MG/M**2)

SEASON=SPRING81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	21.84	32.97	1161	163.5	156.2	65.97	219.0	38.62	13.99	33.38	151.0	4.01	1.458	0.121	3.120	28.71	2.620	0.243	23.78	2.421	0.021
2	19.51	20.51	1051	149.0	176.6	51.96	170.1	33.47	16.59	23.01	146.8	2.42	1.247	0.111	2.115	24.39	1.378	0.222	22.59	1.421	0.044
3	8.52	13.15	1177	169.5	93.5	57.28	109.1	17.23	10.11	12.67	91.1	2.45	1.368	0.096	1.827	.	1.008	0.079	22.18	0.747	0.042
4	13.20	19.66	1089	160.8	.	65.85	284.1	66.96	17.07	48.36	209.0	10.21	2.118	0.121	2.675	13.22	2.415	0.241	11.28	3.018	0.072
5	12.09	20.60	963	154.4	110.9	51.45	206.0	23.55	15.22	26.80	161.5	5.21	1.164	0.199	3.134	25.66	1.462	0.228	15.97	1.590	0.089
7	9.07	11.90	724	104.3	86.4	37.50	140.9	24.94	9.18	18.00	118.5	9.79	0.630	0.068	1.195	12.37	0.796	0.136	14.90	0.792	0.024
8	12.86	16.09	937	131.8	145.8	40.35	202.9	35.34	8.72	14.59	176.8	2.87	1.103	0.113	1.711	17.32	1.167	0.226	19.16	1.387	0.033
9	8.04	6.49	690	129.7	60.4	43.92	168.0	13.71	16.80	19.08	120.0	3.86	0.711	0.073	1.387	14.11	0.397	0.145	8.96	0.556	0.021
10	11.10	9.01	843	126.2	89.3	68.72	189.4	26.77	11.88	26.92	134.8	7.33	0.768	0.160	2.184	16.47	2.894	0.234	.	.	0.021
11	1.60	7.04	898	132.1	.	59.88	220.5	27.02	14.89	34.43	149.8	8.64	1.510	0.084	1.798	18.44	0.833	0.167	16.13	1.514	0.047
13	6.42	13.37	728	107.9	126.9	50.88	136.9	17.25	7.83	22.51	104.4	2.71	1.366	0.109	2.050	30.52	1.180	0.217	30.35	1.474	0.028
14	6.66	12.42	984	139.8	169.0	79.82	122.7	21.94	27.56	59.73	118.2	3.14	1.351	0.084	1.944	29.22	0.844	0.169	26.94	2.707	0.051
15	4.79	10.03	627	105.4	166.9	40.25	134.3	20.20	9.68	21.59	95.9	2.85	1.261	0.063	2.184	15.00	1.196	0.125	16.05	0.947	0.006
16	12.84	16.58	852	126.1	98.6	49.01	166.9	15.33	9.82	24.65	119.7	6.03	1.117	0.097	1.980	31.87	1.679	0.194	25.55	1.714	0.077
17	11.91	20.23	855	125.4	113.2	85.56	183.4	18.24	35.90	22.12	97.2	6.58	1.594	0.097	1.465	43.58	1.797	0.266	39.37	1.089	0.108
18	13.83	21.57	901	126.8	83.7	45.30	195.1	13.47	17.70	21.51	132.8	7.45	0.918	0.144	3.502	24.33	1.314	0.201	12.81	1.166	1.605
19	11.17	18.43	776	105.4	77.3	34.74	171.8	12.36	15.24	15.45	113.9	5.03	1.413	0.117	1.410	58.73	1.444	0.234	65.45	1.855	0.056
20	12.13	25.35	1089	148.5	101.8	38.76	150.8	16.74	7.12	16.53	133.4	2.08	1.378	0.128	1.939	35.11	1.358	0.204	29.13	0.547	0.027
21	3.71	8.16	441	62.0	70.0	46.50	105.7	12.13	8.45	25.50	71.9	3.94	1.270	0.240	2.614	21.43	0.720	0.160	13.63	0.606	0.057
22	8.16	15.77	674	95.6	103.1	35.33	128.8	16.74	13.81	22.28	93.5	2.87	2.008	0.737	6.406	32.48	1.151	0.226	30.10	0.497	0.049
23	7.46	12.54	549	78.5	82.5	26.68	120.1	13.80	8.05	13.31	103.8	1.29	2.297	0.459	3.599	.	1.686	0.153	97.32	1.139	0.054
24	7.97	15.10	767	86.8	97.8	40.96	146.9	15.89	12.39	23.12	119.2	2.94	2.544	0.390	5.465	74.21	1.741	0.219	75.02	0.572	0.065
25	5.42	10.83	608	52.9	77.3	21.48	120.3	11.52	11.22	15.04	90.3	6.19	1.884	0.202	3.573	33.32	0.971	0.161	28.67	0.579	0.089
26	7.34	14.62	655	86.9	96.0	26.09	143.0	14.20	20.55	13.84	106.1	3.98	2.141	0.255	2.908	34.96	1.050	0.565	39.87	1.138	0.020
27	11.93	20.09	414	40.6	17.8	12.08	68.8	4.35	7.65	5.10	63.8	3.06	0.765	0.255	7.961	7.51	1.020	0.255	7.35	0.337	0.013
28	.	2.60	154	17.4	97.5	28.32	31.8	.	3.75	16.71	63.3	0.60	.	.	.	.	.	.	.	.	.
30	.	2.53	286	39.9	45.4	19.03	60.4	9.02	5.84	8.27	40.3	1.93	2.225	0.053	1.175	14.38	0.384	0.149	10.59	1.450	0.009
31	4.90	9.03	386	74.0	50.3	12.33	113.8	7.39	7.92	6.78	90.1	6.08	0.466	0.068	1.623	16.72	0.499	0.135	16.73	1.545	0.009
	35	.	3.22	189	33.5	.	25.66	50.2	24.68	5.21	21.19	49.4	1.60	9.148	0.193	2.311	.	0.770	0.481	.	2.279	0.010
	36	0.12	4.84	203	32.5	123.7	20.28	84.9	28.94	19.80	23.68	37.5	6.22	3.683	0.132	0.962	.	0.263	0.263	.	4.341	0.053

Table 11:

SEASONAL DEPOSITION (MG/**2)

SEASON=SUMMER81

ID	HF	HT	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	33.11	44.19	2059	218.5	105.6	73.86	233.7	26.77	16.27	14.46	196.1	4.96	1.482	0.157	2.890	21.49	2.892	0.315	19.22	0.872	0.038
2	23.82	32.92	1373	156.6	82.5	45.68	183.8	17.89	14.56	9.00	150.1	2.02	0.859	0.353	1.897	12.81	1.932	0.282	9.91	0.387	0.026
3	21.98	29.86	1199	152.7	87.6	41.47	191.0	15.62	10.27	11.79	140.7	5.11	1.117	0.123	2.558	13.46	1.847	0.246	9.32	0.855	0.068
4	18.42	19.83	1296	154.1	193.2	49.42	176.5	22.33	11.35	11.23	219.6	1.96	1.273	0.098	1.572	12.92	1.904	0.196	9.21	0.288	0.051
5	16.87	23.08	1008	127.7	124.7	39.37	140.3	22.67	12.15	6.82	115.3	2.73	1.020	0.155	1.922	11.99	1.767	0.190	11.34	0.361	0.052
7	20.43	21.38	844	143.3	96.6	36.39	124.6	11.83	35.92	7.59	98.3	1.93	1.126	0.241	1.815	12.89	1.788	0.192	10.37	0.597	0.028
8	8.91	23.02	1286	132.0	42.2	63.44	218.2	32.48	21.68	40.33	167.5	4.32	1.152	0.585	5.444	15.58	2.510	0.246	9.27	0.207	0.009
9	17.35	23.41	928	103.3	46.9	27.64	129.1	10.45	5.66	6.14	99.2	2.19	0.582	0.249	0.913	6.40	1.147	0.199	4.48	0.229	0.023
10	21.07	31.61	1997	185.4	142.8	57.09	318.6	23.01	14.16	23.48	264.0	8.85	1.537	0.180	2.527	12.86	2.890	0.295	10.52	0.492	0.038
11	25.98	35.40	1629	179.4	201.0	41.55	232.4	17.24	10.41	4.18	172.9	3.54	1.254	0.157	2.448	15.31	2.628	0.314	11.99	0.521	0.038
13	12.93	24.20	1068	130.4	107.0	34.78	193.4	14.85	14.67	9.40	123.9	4.70	0.738	0.106	1.240	12.73	1.498	0.211	9.83	0.458	0.011
14	22.63	33.32	1400	148.8	81.7	36.85	241.5	13.14	22.64	17.62	186.7	14.51	0.796	0.133	1.737	9.28	2.454	0.265	7.14	0.574	0.027
15	12.25	20.49	1559	161.4	226.0	49.55	212.9	.	19.62	25.00	166.0	7.89	2.106	0.476	3.167	18.58	2.863	0.328	10.60	0.338	0.033
16	35.56	29.75	1436	120.3	82.9	60.93	380.4	13.39	38.10	34.29	96.2	30.85	0.863	0.173	2.374	7.89	4.454	0.346	8.43	0.484	0.034
17	21.61	31.71	1262	112.2	75.7	35.40	112.9	16.07	38.80	24.65	136.9	18.38	0.411	0.115	1.453	5.37	1.950	0.231	2.47	0.217	0.023
18	16.85	24.62	996	103.6	51.1	28.84	100.3	8.38	35.40	6.06	128.0	1.72	1.220	0.257	2.785	20.54	3.729	0.230	7.84	0.579	0.041
19	28.91	30.41	1158	100.8	37.0	34.12	151.4	5.23	34.74	5.97	104.5	13.98	0.756	0.147	4.183	7.76	1.609	0.295	4.64	0.408	0.022
20	20.84	29.36	1150	123.4	60.9	41.58	188.9	10.10	20.16	8.60	153.5	3.00	1.197	0.171	1.597	17.81	1.618	0.245	6.42	0.295	0.081
21	20.09	30.70	1823	210.6	70.0	34.13	315.9	17.59	10.72	11.77	287.5	4.69	1.215	0.202	4.394	23.85	2.430	0.405	31.23	3.247	0.040
22	28.34	41.62	1571	140.0	69.0	73.27	191.3	11.84	38.18	15.46	136.5	6.34	1.683	0.366	2.626	55.75	2.985	0.394	50.42	1.075	0.114
23	16.18	22.89	978	109.3	58.2	28.06	257.3	11.10	16.11	6.06	119.9	6.34	1.032	0.316	2.292	10.82	1.569	0.234	6.17	0.695	0.032
24	9.37	19.87	803	73.9	21.1	21.56	297.7	11.09	22.76	8.96	115.9	33.94	1.148	0.252	2.804	7.71	0.996	0.224	2.18	0.432	0.026
25	12.51	25.51	1353	88.3	41.1	25.53	113.0	9.08	55.17	9.47	84.1	40.36	1.103	0.188	2.408	16.98	2.317	0.288	11.72	0.832	0.089
26	11.37	17.33	546	52.3	29.4	13.48	92.2	5.83	10.04	5.94	63.3	4.96	0.747	0.124	1.540	5.37	1.491	0.249	6.29	0.521	0.026
27	5.20	7.76	293	35.4	50.1	10.84	112.9	20.08	15.65	3.34	65.8	6.78	0.919	0.119	1.472	6.76	0.850	0.238	5.95	1.403	0.017
28	7.85	7.31	205	21.8	102.4	10.72	83.0	17.92	7.06	5.00	41.5	1.52	0.595	0.346	1.785	8.45	1.068	0.219	5.77	1.955	0.041
30	.	4.99	164	21.5	75.1	11.45	87.7	14.96	17.85	3.90	45.6	5.34	0.605	0.066	0.641	3.97	0.537	0.132	3.03	0.159	0.008
31	5.11	11.55	298	39.8	41.7	17.46	92.4	6.40	10.38	13.07	35.8	4.72	0.618	0.154	2.219	3.55	0.925	0.309	2.70	0.333	0.019
35	0.89	8.73	174	40.5	32.3	19.50	129.4	5.06	12.38	3.00	81.6	8.06	1.575	0.112	2.587	.	2.250	0.225	.	0.844	0.022
36	1.09	13.18	181	20.9	51.0	27.27	85.3	8.23	23.06	6.59	34.6	4.74	0.659	0.082	0.659	21.91	0.329	0.165	5.27	0.165	0.008

Table 12:

SEASONAL DEPOSITION (MG/M**2)

SEASON=AUTUMN81

ID	HF	HI	SO4	NNO3	CA	CL	NTKN	MG	K	NA	NNH4	PPO4	MN	NI	ZN	FE	PB	V	AL	CU	CD
1	19.50	27.57	1170	135.8	127.0	28.78	126.9	23.85	22.11	8.88	97.4	7.93	1.207	0.153	3.665	13.15	3.334	0.241	7.88	0.648	0.059
2	15.06	22.11	929	117.9	95.4	29.43	131.8	14.97	14.57	7.57	106.8	7.37	0.795	0.364	1.776	10.48	2.264	0.227	7.26	0.837	0.055
3	17.01	23.45	805	116.5	64.1	18.78	95.0	8.45	7.24	6.02	79.6	2.36	0.621	0.107	1.621	7.66	2.061	0.214	5.67	0.656	0.020
4	9.04	17.49	996	123.1	167.8	56.04	207.8	15.62	18.16	11.58	160.8	12.47	0.892	0.108	2.002	8.42	1.862	0.216	6.78	0.334	0.023
5	14.36	23.30	850	124.8	96.5	19.29	124.8	13.69	7.91	9.70	89.4	4.10	0.724	0.142	1.621	8.50	1.927	0.284	4.31	0.468	0.047
6	14.82	27.44	910	145.6	87.3	29.11	134.6	9.10	7.28	7.28	129.5	2.91	0.728	0.182	2.319	10.41	2.547	0.364	.	4.185	0.036
7	1.78	9.90	643	98.5	106.6	38.20	101.3	32.40	5.40	10.80	81.0	2.70	1.512	0.108	5.160	17.67	2.146	0.216	8.44	1.756	0.165
8	10.13	17.77	716	91.6	95.8	17.80	119.6	18.63	10.46	7.54	102.2	3.37	0.728	0.116	2.791	8.44	1.475	0.232	7.91	1.202	0.073
9	11.08	19.84	698	94.1	68.3	16.53	118.0	13.21	9.72	10.16	82.4	4.87	0.447	0.105	3.159	11.40	2.862	0.230	9.15	1.142	0.128
10	17.68	21.39	852	126.0	135.6	56.90	164.1	36.41	6.77	17.50	119.2	8.28	0.898	0.171	3.108	13.42	4.140	0.255	9.41	0.984	0.183
11	19.14	28.21	982	129.5	75.1	21.48	116.6	9.39	6.34	4.50	94.3	3.43	0.634	0.225	1.535	7.67	2.148	0.266	3.51	0.784	0.041
12	15.22	22.69	660	89.8	50.0	18.03	72.3	3.91	10.90	7.68	55.3	3.53	0.431	0.165	2.232	5.98	1.584	0.255	3.67	0.498	0.066
13	16.27	24.38	919	138.0	58.5	28.30	209.8	5.54	12.44	9.48	139.4	13.22	0.984	0.246	2.631	9.11	3.039	0.321	4.63	1.496	0.025
14	24.46	33.52	1068	163.4	50.6	33.25	130.2	9.33	21.00	15.02	115.5	7.81	0.802	0.157	1.815	7.25	2.768	0.315	4.30	0.834	0.024
15	12.05	24.20	997	148.3	161.6	29.53	287.5	36.46	15.13	8.44	106.7	23.16	1.356	0.173	2.733	11.93	2.704	0.347	6.88	1.725	0.040
16	14.09	22.53	683	115.8	93.9	26.67	86.5	7.56	10.58	11.31	72.2	4.89	0.988	0.215	2.879	8.86	1.725	0.266	3.05	1.191	0.110
17	15.95	23.92	696	93.3	20.0	12.36	82.5	4.24	5.32	6.20	58.1	7.52	0.604	0.144	2.212	3.48	1.780	0.244	1.35	1.039	0.026
18	12.40	19.94	1041	136.1	46.1	26.96	63.1	6.33	56.35	8.71	49.5	2.52	0.378	0.106	1.138	3.62	1.594	0.213	2.13	0.470	0.064
19	15.36	26.85	752	99.2	27.0	14.03	116.9	1.78	5.88	7.96	77.6	4.77	0.525	0.388	1.583	6.66	1.890	0.335	3.58	0.758	0.083
20	17.53	29.85	1051	136.5	60.0	26.74	171.2	9.11	9.37	12.39	135.3	7.08	1.353	0.199	1.451	11.63	2.272	0.399	8.43	0.743	0.034
21	20.77	31.33	861	135.5	50.5	9.07	121.8	8.80	46.00	4.75	70.8	2.45	0.706	0.166	2.244	7.67	1.744	0.331	3.75	1.549	0.067
22	13.74	22.36	561	79.7	28.3	14.34	70.9	2.01	8.52	7.83	57.6	2.99	0.582	0.145	0.959	13.69	1.323	0.291	2.69	0.630	0.037
23	13.52	21.78	637	90.2	21.3	8.36	83.7	2.23	4.42	5.54	68.9	2.63	0.332	0.111	1.608	4.58	1.432	0.222	1.39	0.710	0.038
24	11.86	19.28	585	63.8	21.3	9.39	44.0	2.52	6.14	4.13	32.7	5.21	1.050	0.122	2.283	5.56	0.991	0.243	2.28	1.226	0.073
25	7.59	16.19	307	32.9	10.5	5.44	58.9	1.34	2.66	8.31	21.7	3.82	0.316	0.061	2.030	4.45	0.460	0.121	1.29	0.211	0.019
26	7.38	14.85	331	41.6	26.5	6.93	41.2	2.04	8.88	8.04	22.1	2.91	0.499	0.121	1.782	5.75	0.738	0.243	1.82	0.695	0.023
27	7.35	10.84	316	34.8	12.3	16.20	64.1	1.14	26.84	12.38	74.4	17.39	0.181	0.114	1.412	3.40	0.361	0.228	1.49	0.232	0.139
28	6.19	17.18	438	71.6	70.0	.	87.5	22.28	53.11	.	65.3	1.11	.	.	.	.	.	.	.	.	.
30	.	3.42	204	36.4	80.8	15.32	36.7	17.16	2.70	3.59	26.9	3.80	0.681	0.058	1.105	23.16	0.456	0.116	8.96	0.348	0.019
31	6.06	12.19	298	53.0	17.6	5.63	52.5	2.27	3.28	6.26	40.3	4.11	0.212	0.093	1.308	3.27	1.181	0.186	2.16	0.367	0.029
34	2.30	4.71	139	27.5	14.7	1.50	36.6	1.79	1.50	1.85	32.0	1.10	0.219	0.038	0.692	3.43	0.388	0.075	1.59	0.472	0.011
35	2.00	7.87	185	27.2	22.7	12.07	39.8	3.19	12.44	8.56	40.1	10.79	0.382	1.119	0.811	8.05	0.737	0.191	7.20	0.868	0.016
36	0.80	4.94	169	28.0	63.2	6.75	39.4	11.40	7.66	5.18	26.1	6.08	0.698	0.075	0.849	10.73	0.564	0.149	13.21	0.570	0.015

TABLE 13: NETWORK STATION IDENTIFICATIONS

Network	Station Number	Station Name
APIOS	1	Colchester
	2	Merlin
	3	Port Stanley
	4	Wilkesport
	5	Alvinston
	6	Huron Park
	7	Waterloo
	8	Palmerston
	9	Shallow Lake
	10	Milton
	11	Uxbridge
	12	Coldwater
	13	Campbellford
	14	Kaladar
	15	Smith's Falls
	16	Dalhousie Mills
	17	Golden Lake
	18	Wilberforce
	19	Whitney
	20	Dorset
	21	McKellar
	22	Mattawa
	23	Killarney
	24	Bear Island
	25	Gowganda
	26	Ramsey
	27	Moonbeam
	28	Attawapiskat
	29	Winisk
	30	Nakina
	31	Dorion
	32	Quetico Centre
	33	Lac La Croix
	34	E.L.A.
	35	Ear Falls
	36	Pickle Lake
NADP	37	Indiana DNL
	38	U of M Bio. Stn
	39	Houghton
	40	Is. Royale N.P.
	41	Kellogg Bio. Stn
	42	Wellston
	43	Marcell Ex. Frst
	44	Fernberg
	45	Aurora R. Farm
	46	Chautauqua
	47	Bennett Bridge
	48	Jesper
	49	Lake Dubay
	50	Trout Lake
	51	Spooner
CANSAP	52	Simcoe
	53	Mt. Forest
	54	Peterborough
	55	Kingston
	56	Moosonee
	57	Atikokan
	58	Trout Lake
	59	Bissett
	60	Maniwaki
	61	Chibougamau

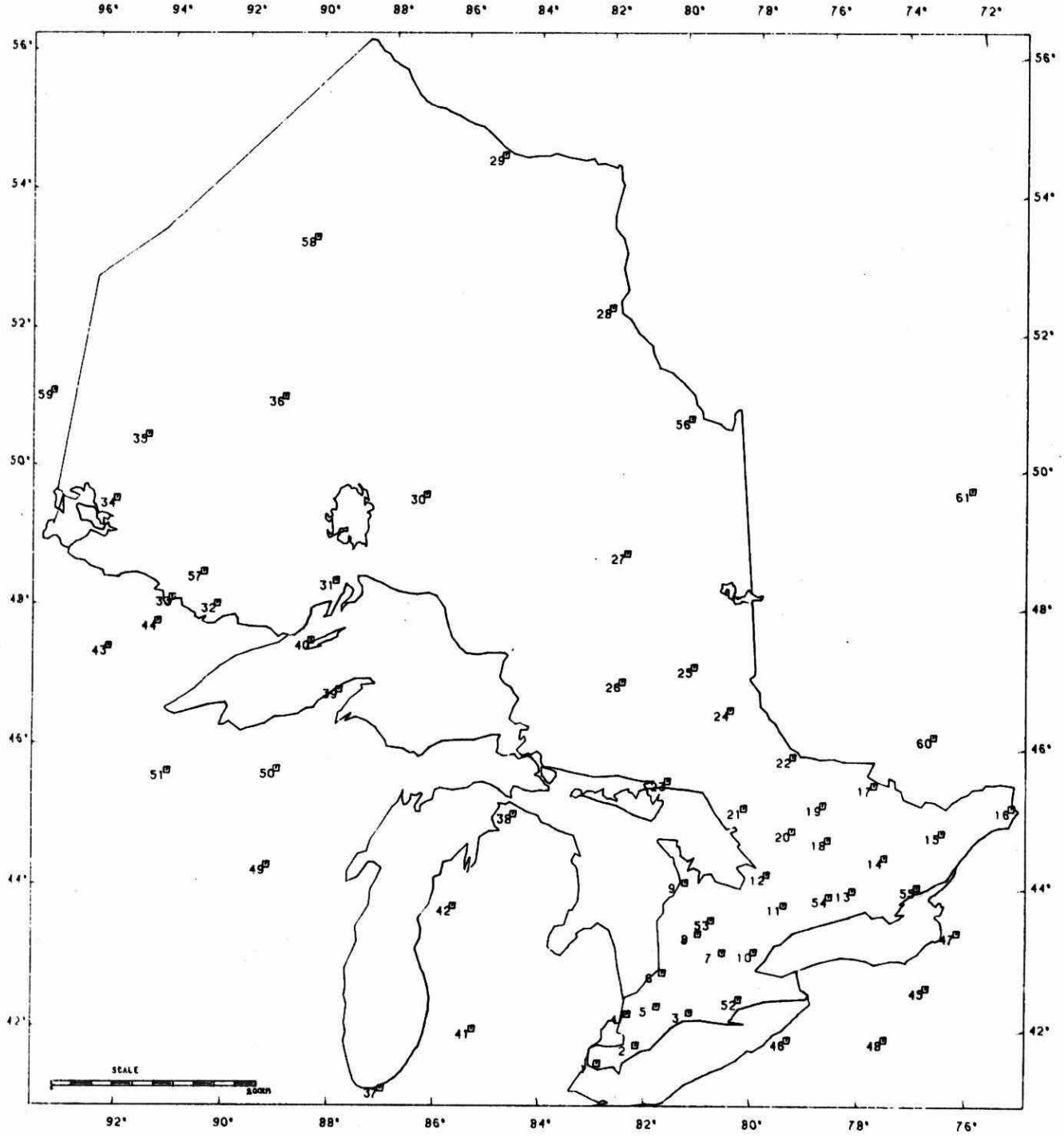

FIGURE 1A: MAP SHOWING SITE LOCATIONS

CLIMAT

1	ATIKOKAN	26	EARLTON	51	OTTAWA	76	TIMMINS
2	AVONMORE	27	FRENCH R CH	52	OWEN SOUND	77	TOBERMORY
3	BALLANTRAE	28	GEORGETOWN W	53	PARRY SOUND	78	TRENTON
4	BANCROFT	29	GERALDTON	54	PELEE ISLAND	79	VERMILLION
5	BARWICK	30	GORE BAY	55	PETERBOROUGH	80	WALLACE BURG
6	BEARDMORE	31	HALIBURTON	56	PICKLE	81	WATERLOO
7	BIG TROUT LK	32	HAMILTON M	57	PICTON	82	WIARTON
8	CAMPBELLFORD	33	HORNEPAYNE	58	P DALHOUSI	83	WINDSOR
9	CARAMET	34	HUNTSVILL MOE	59	P HOPE	84	AMOS
10	CHALK RIVER AEC	35	IGNACE TCPL	60	P STANLEY	85	BELLETERRE
11	CHAPLEAU A	36	KAPUSKASING	61	RAMSAY	86	CHIBOUGAMAU
12	CHATHAM WATER W	37	KENORA	62	RED LAKE	87	GILLAM
13	COCHRANE	38	KINGSTON	63	RENFREW	88	MANIWAKI
14	COLDWATER WARMI	39	KINGSVILL MOE	64	ST. CHARLES	89	MATAGAMI
15	COMBERMERE	40	KIRKLAND L	65	SALTFORD	90	NOTRE DAME D P
16	CORNWELL OH	41	LONDON	66	SARNIA	91	POSTE D L BAL
17	CRYSTAL FALLS	42	MADAWASKA	67	SCOTLAND		
18	DALKEITH PHM	43	MALLORYTOWN L	68	SIOUX LOOKOUT		
19	DASHWOOD	44	MINE CENTRE	69	SLEEMAN		
20	DORION TCPL	45	MORRISBURG	70	SMITH FALLS		
21	DORSET MOE	46	MT. FOREST	71	SOUTH BAY M		
22	DRYDEN	47	NEW GLASGOW	72	SOUTH RIVER		
23	DUNCHURCH	48	NORTH BAY	73	SUDBURY		
24	DUNNVILLE PS	49	OAKVILLE S E	74	TAVISTOCK		
25	EAR FALLS	50	ORANGEVILLE MOE	75	THUNDER BAY		

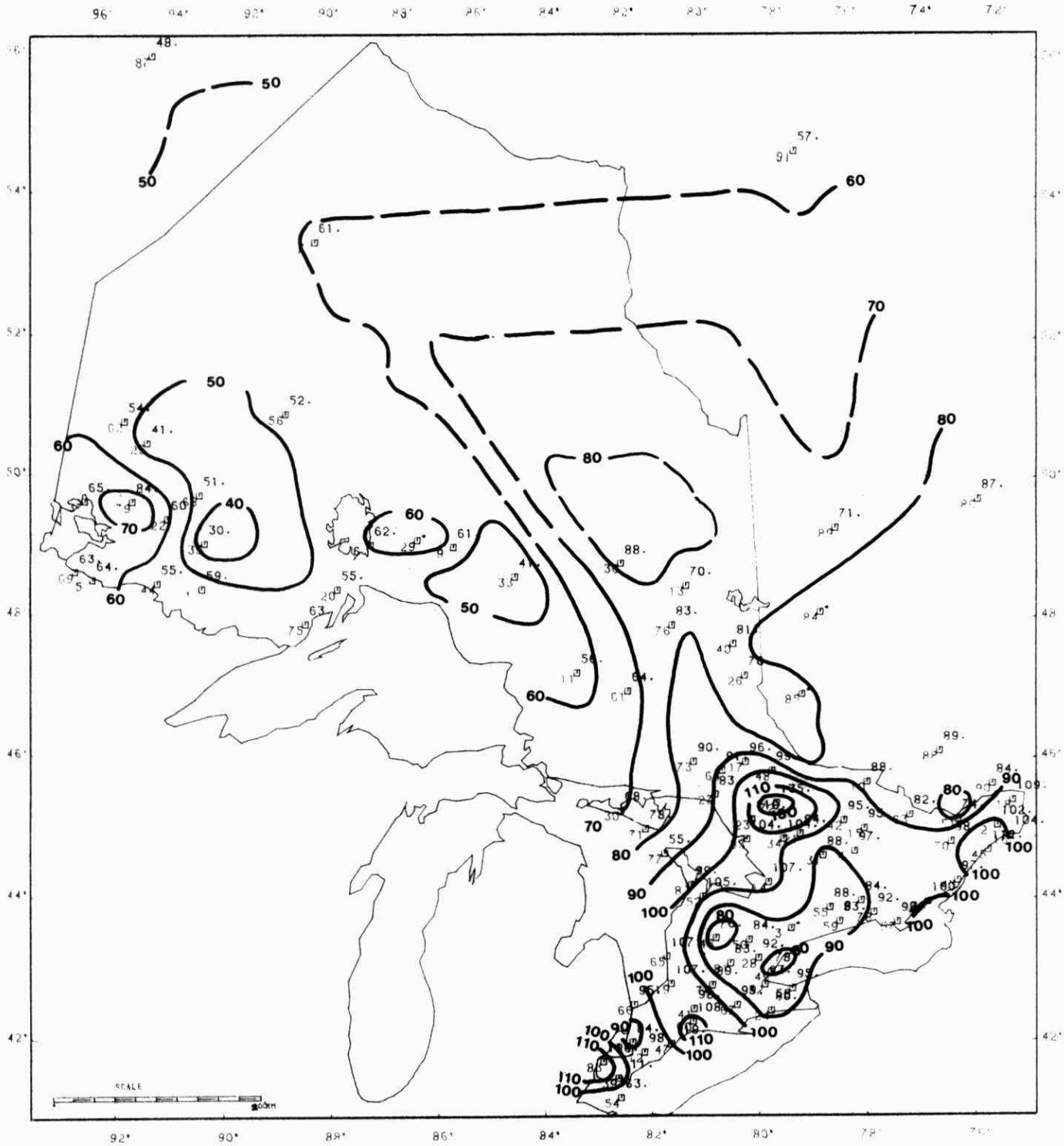

FIGURE 1B. ANNUAL CLIMAT GAUGE DEPTH (CM) OF 1981

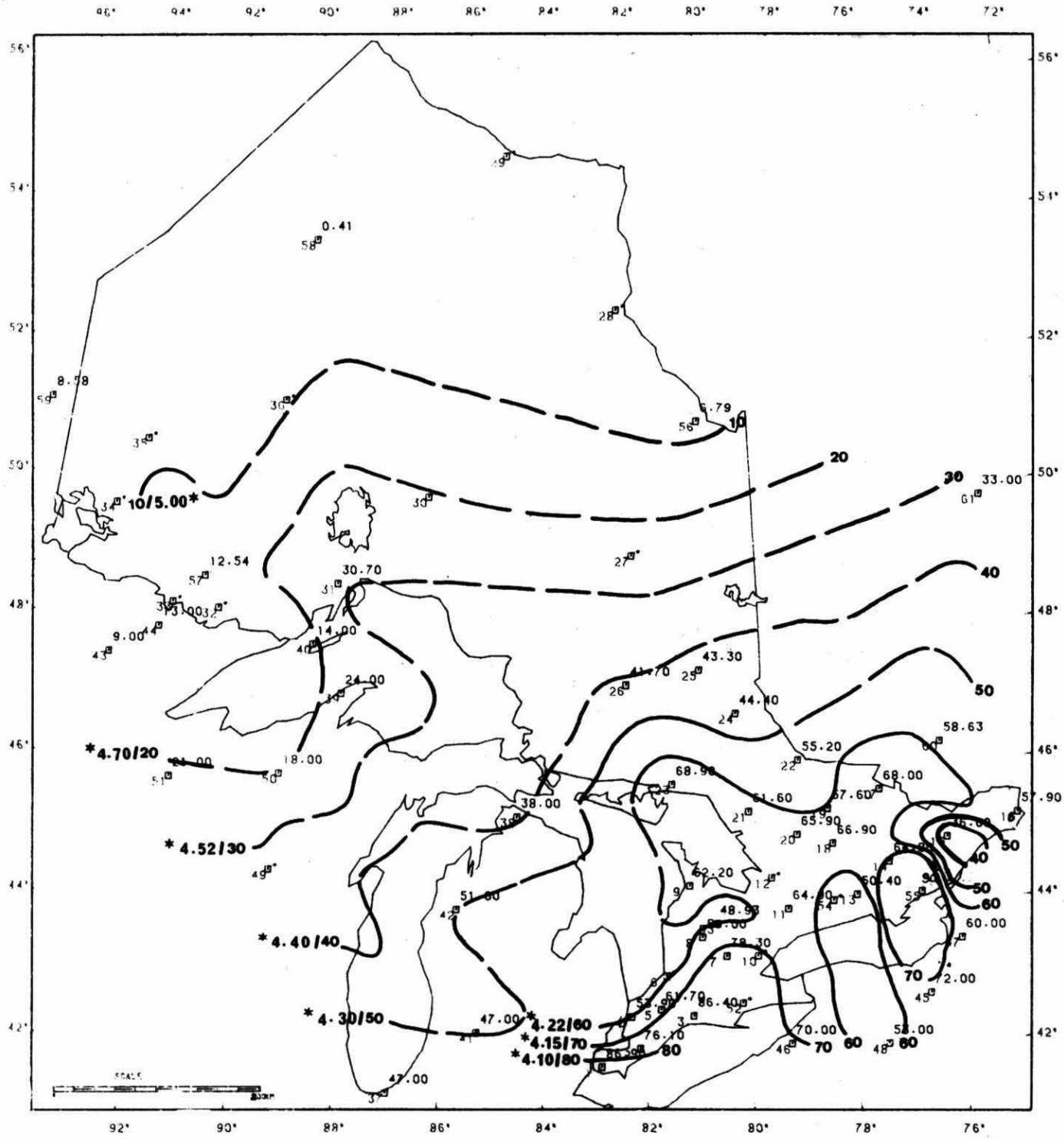

Figure 5: AVERAGED ANNUAL CONCENTRATON (UG/L) OF H_f - 1981

* pH VALUES

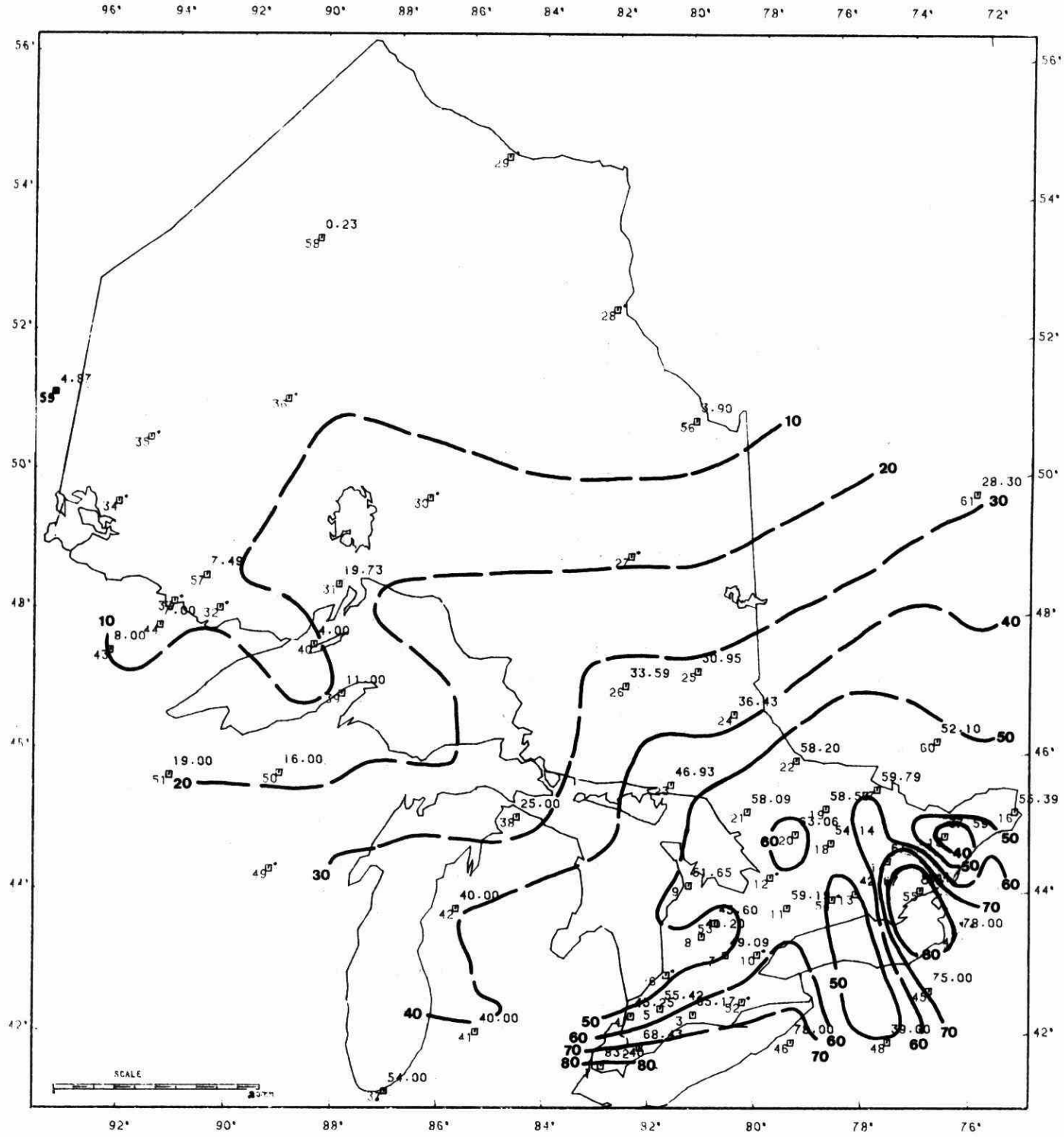

FIGURE 2B. ANNUAL DEPOSITION (MG/M**2) OF H_f - 1981

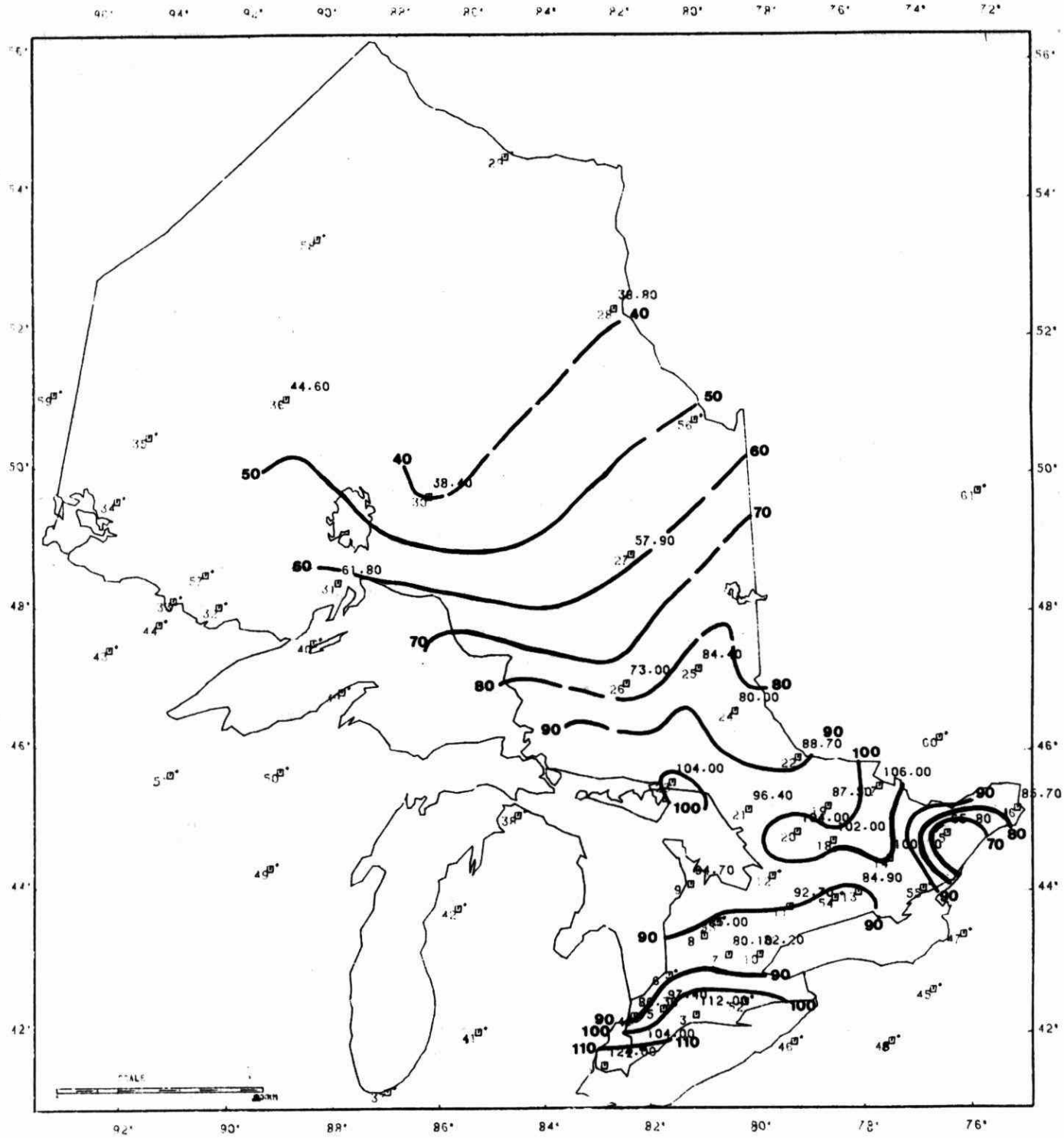

FIGURE 3A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF H_g - 1981

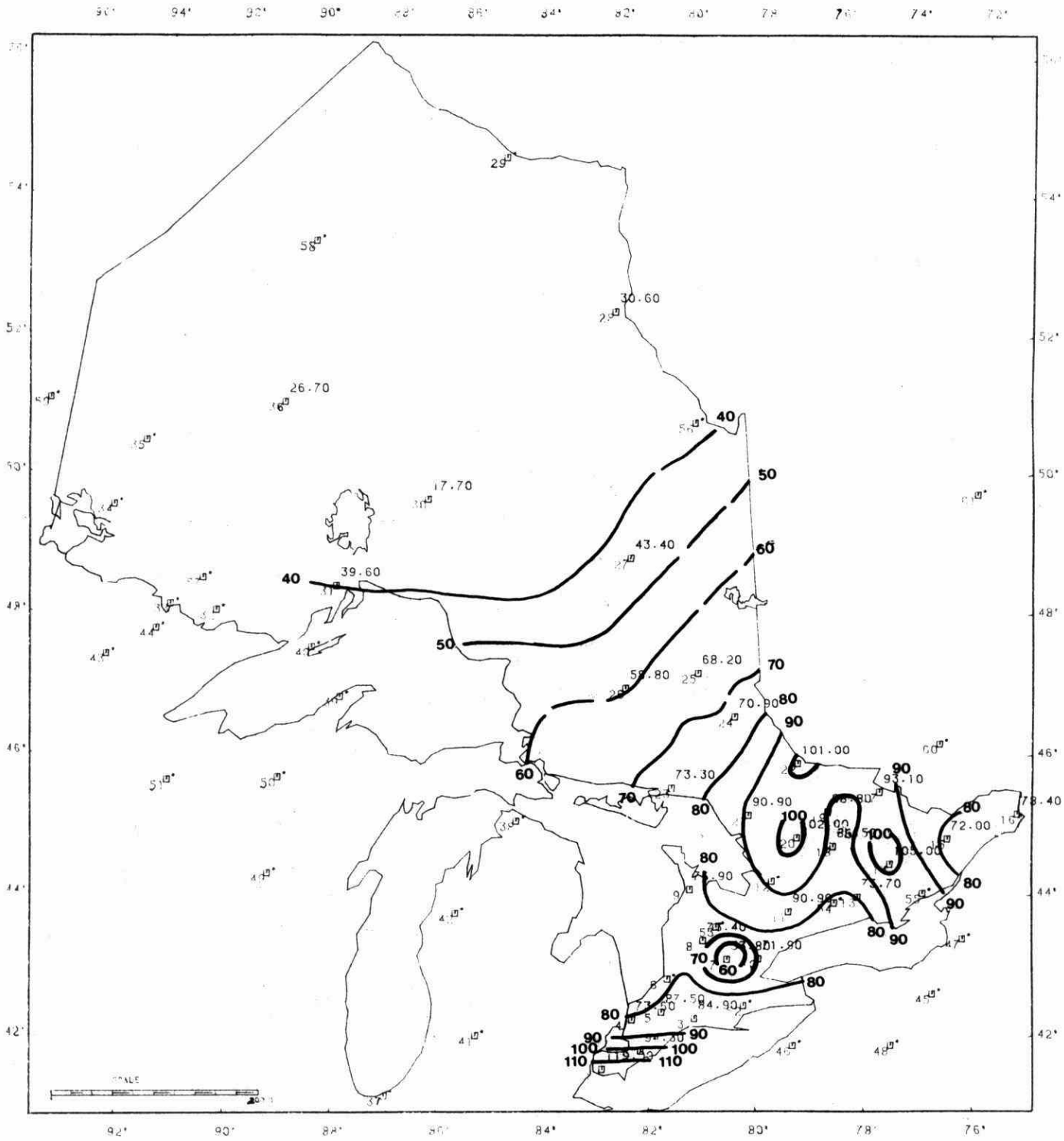

FIGURE 3B. ANNUAL DEPOSITION (MG/M**2) OF H_t - 1981

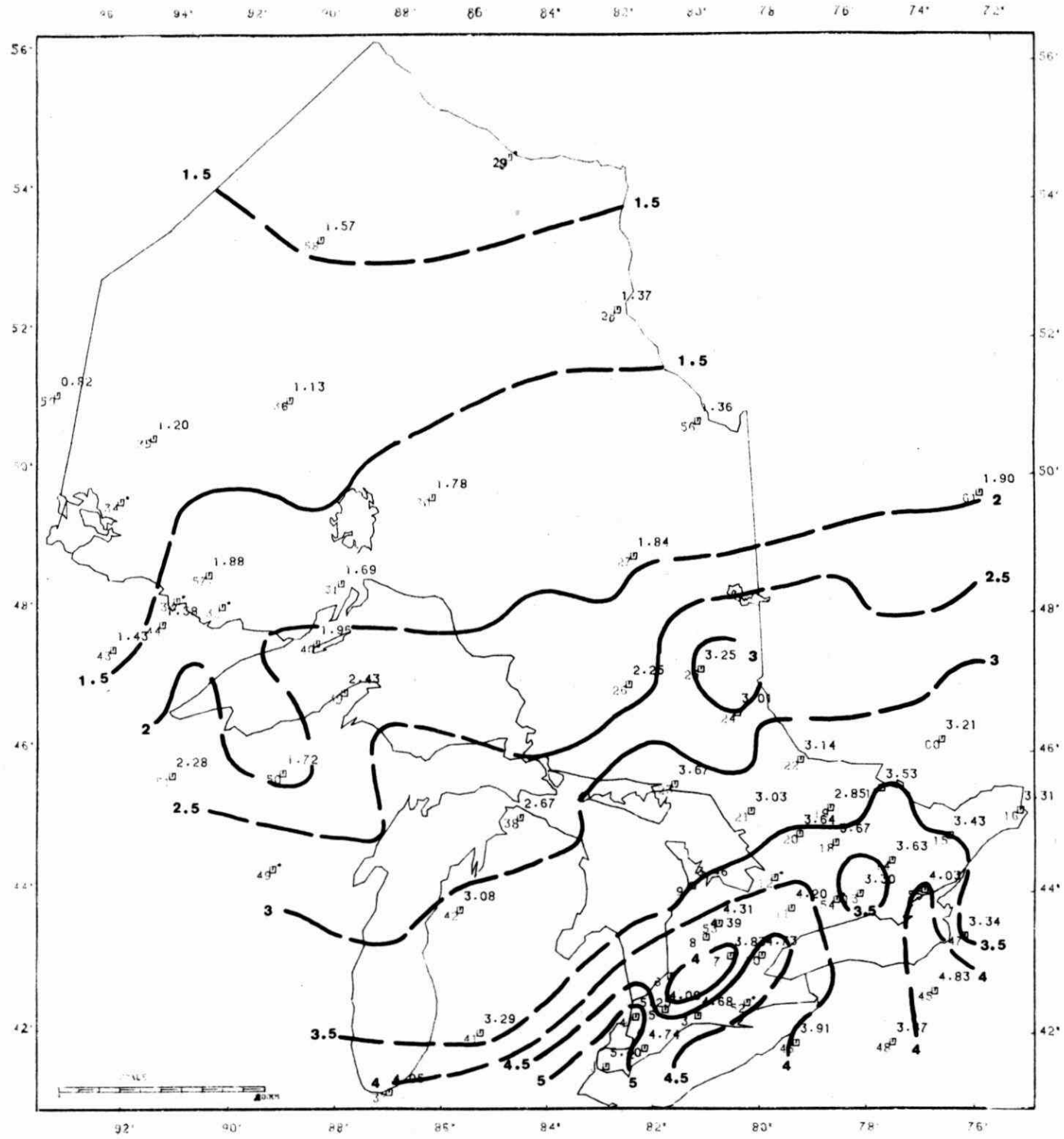

FIGURE 4A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF SO4 1981

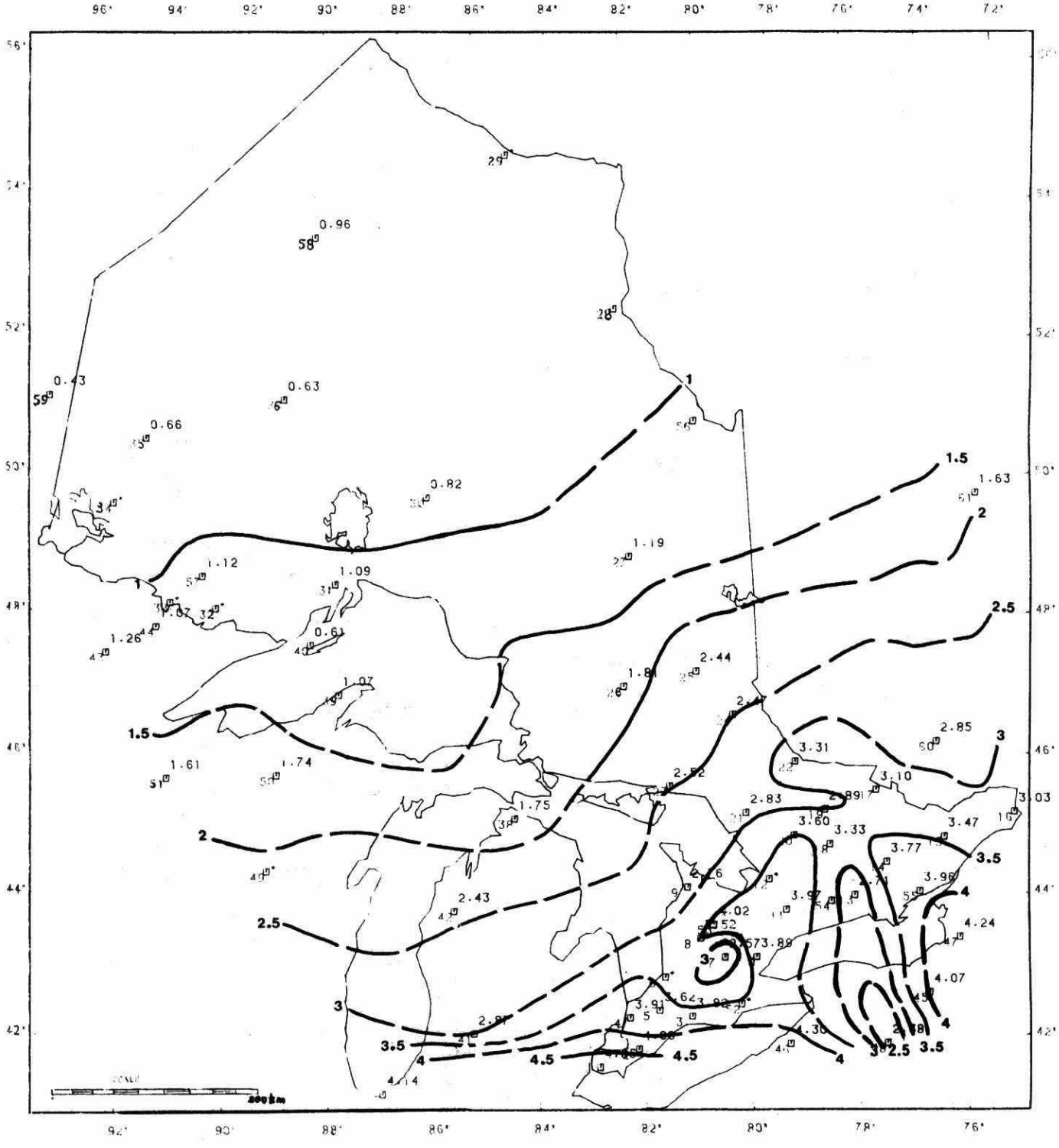

Figure 4: ANNUAL DEPOSITION(G/M**2) OF SO4 - 1981

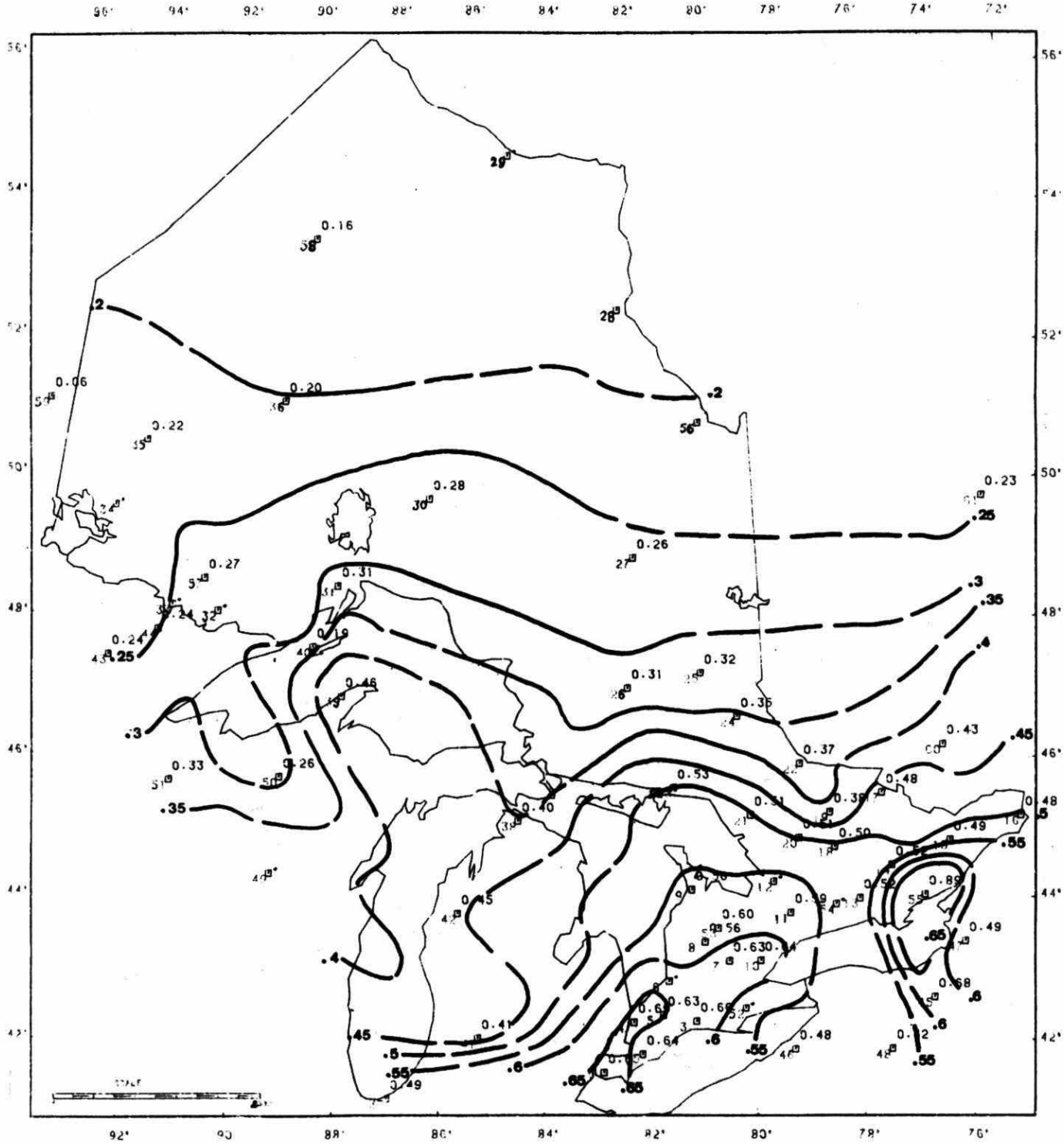

FIGURE 5A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF N-NO3 - 1981

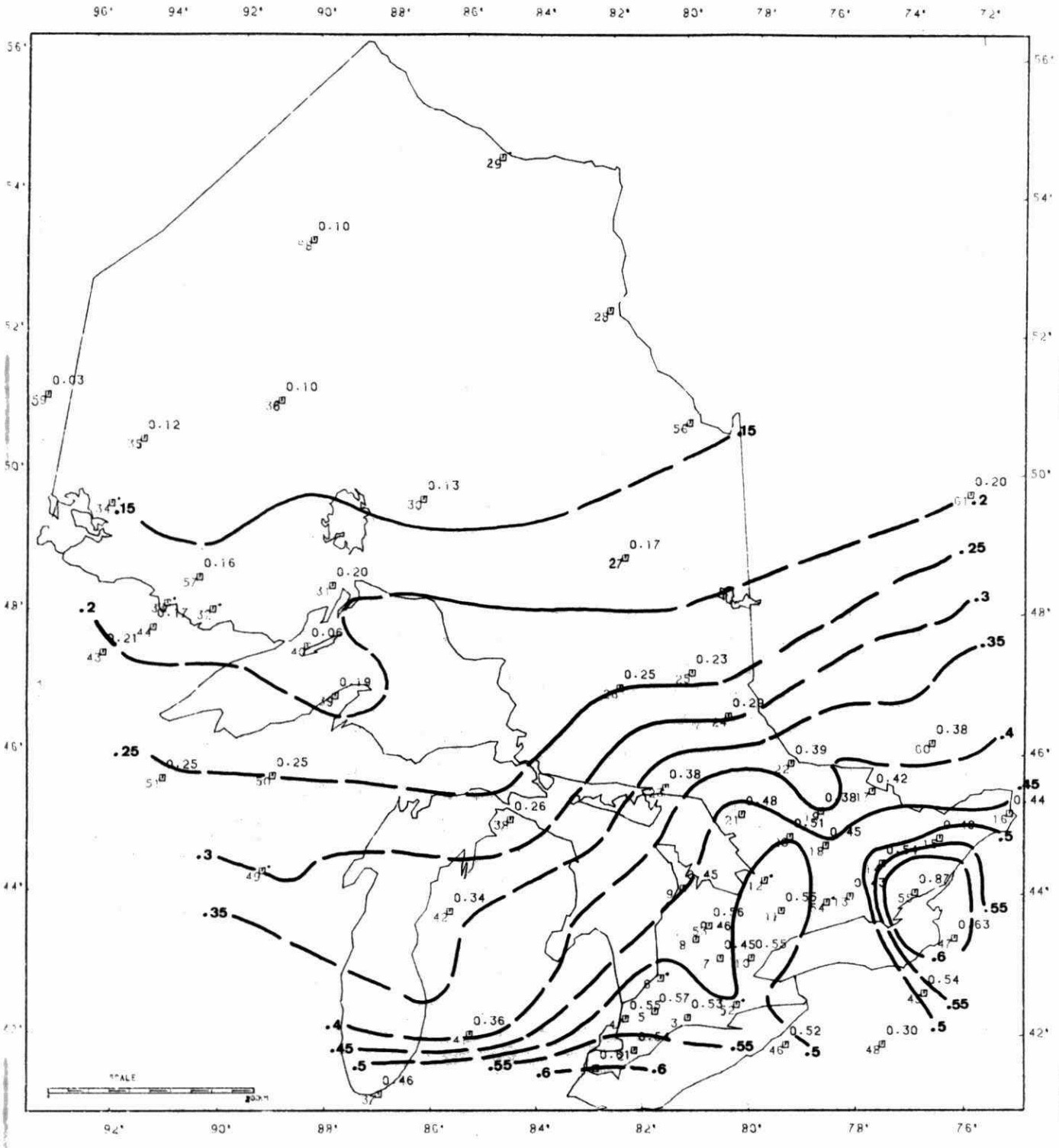

FIGURE 5B. ANNUAL DEPOSITION (G/M**2) OF N-NO3 - 1981

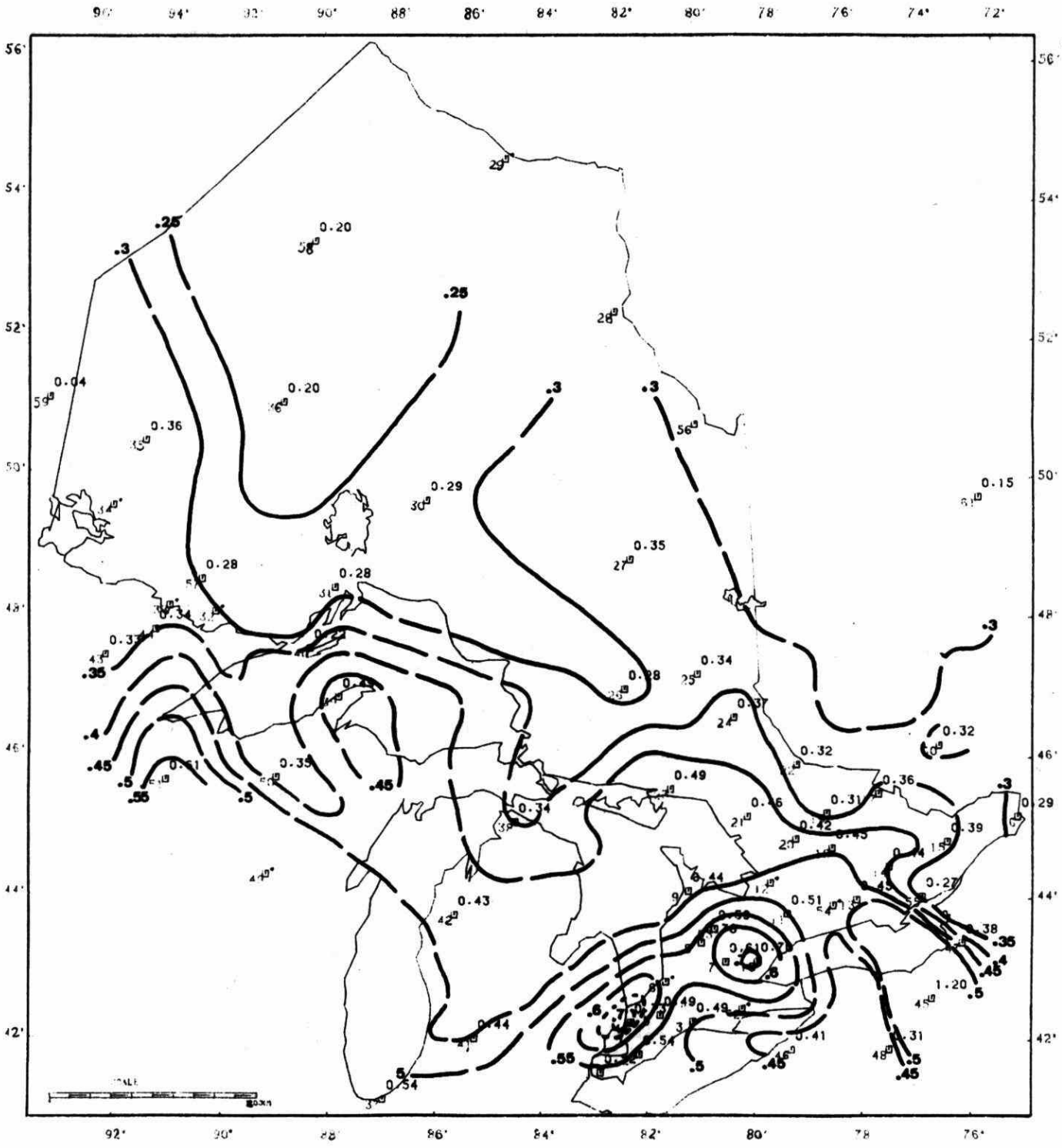

FIGURE 6A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF N-NH4 - 1981

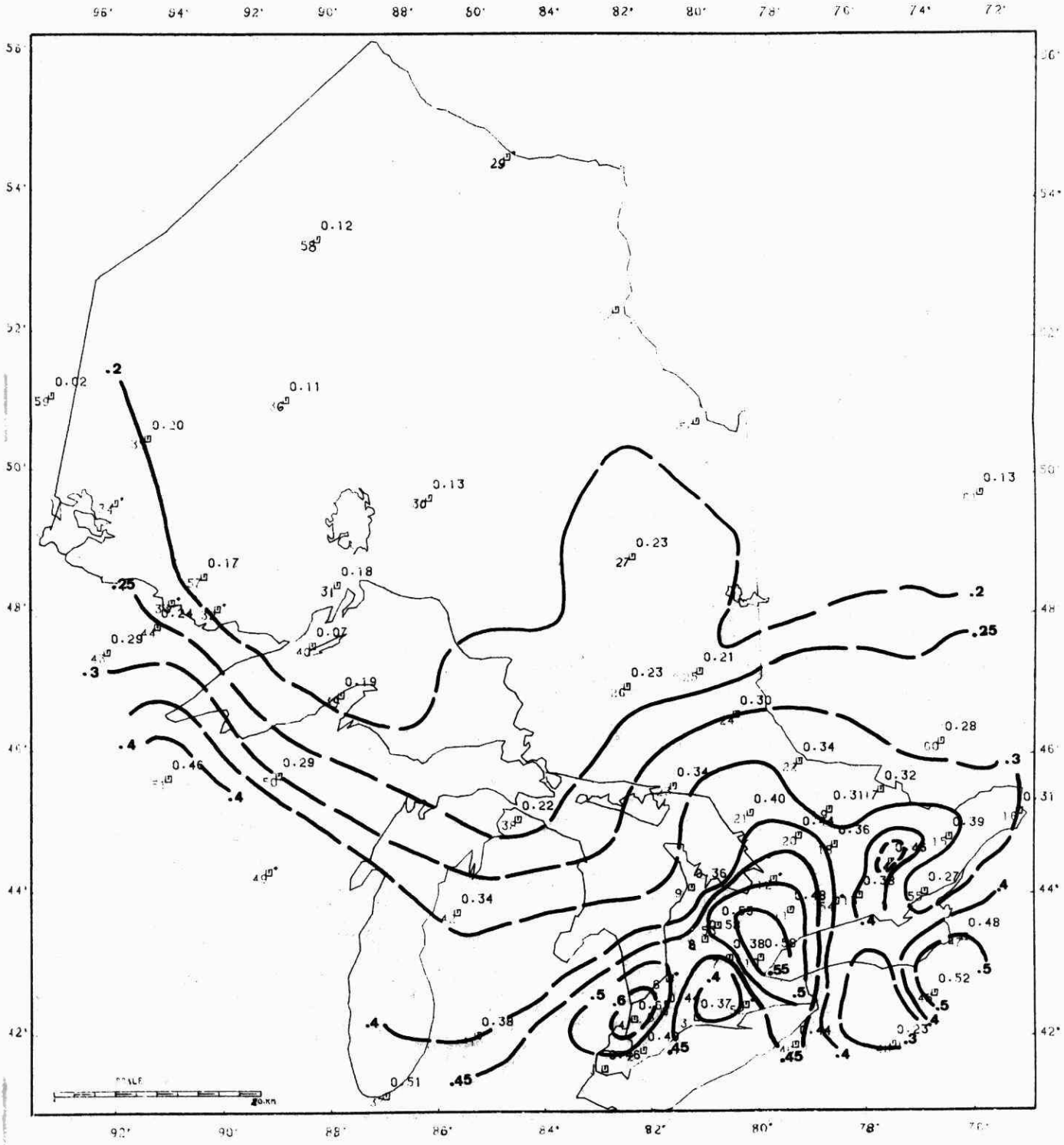

FIGURE 6B. ANNUAL DEPOSITION(G/M**2) OF N-NH4 - 1981

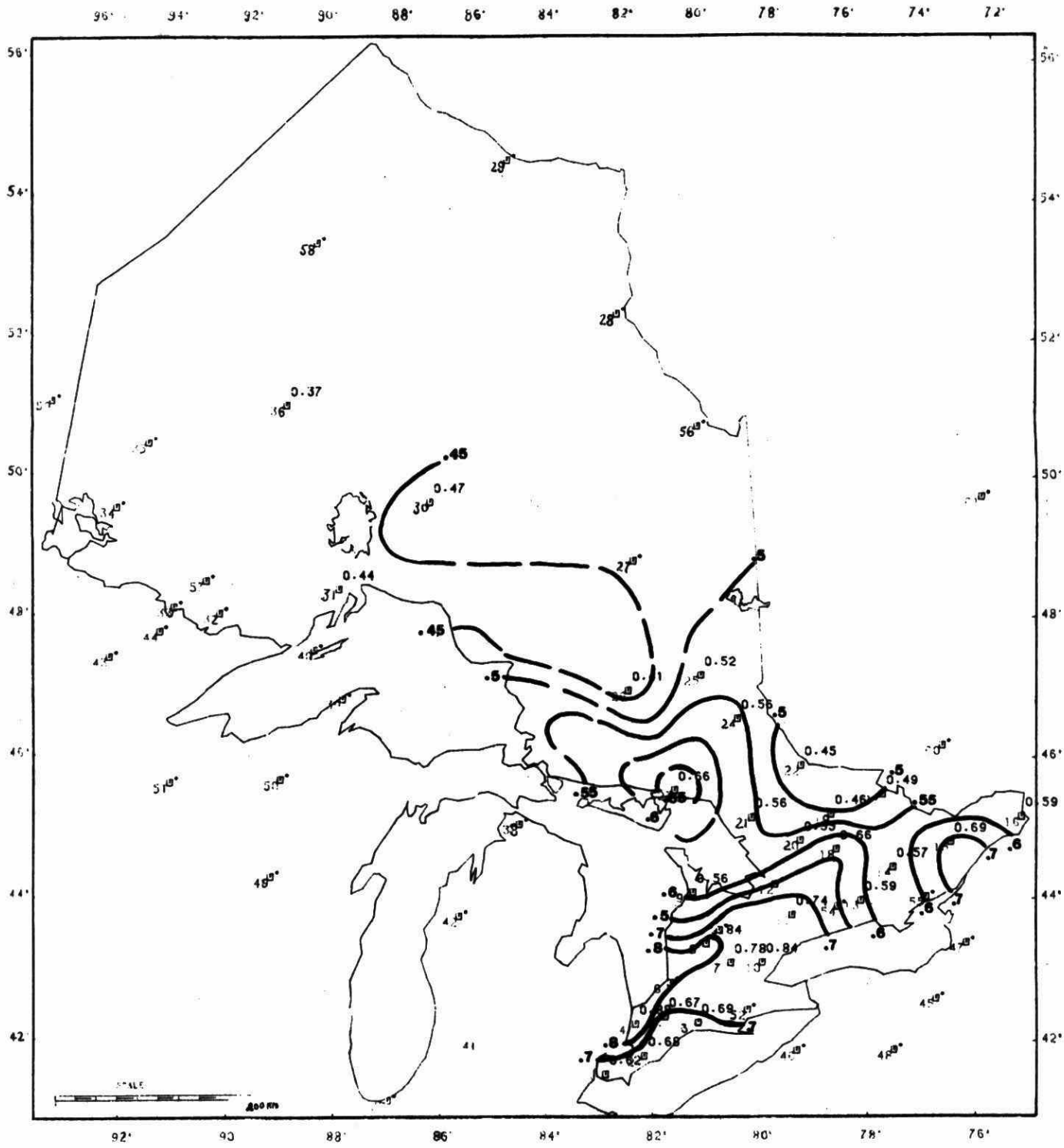

FIGURE 7A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF N-TKN - 1981

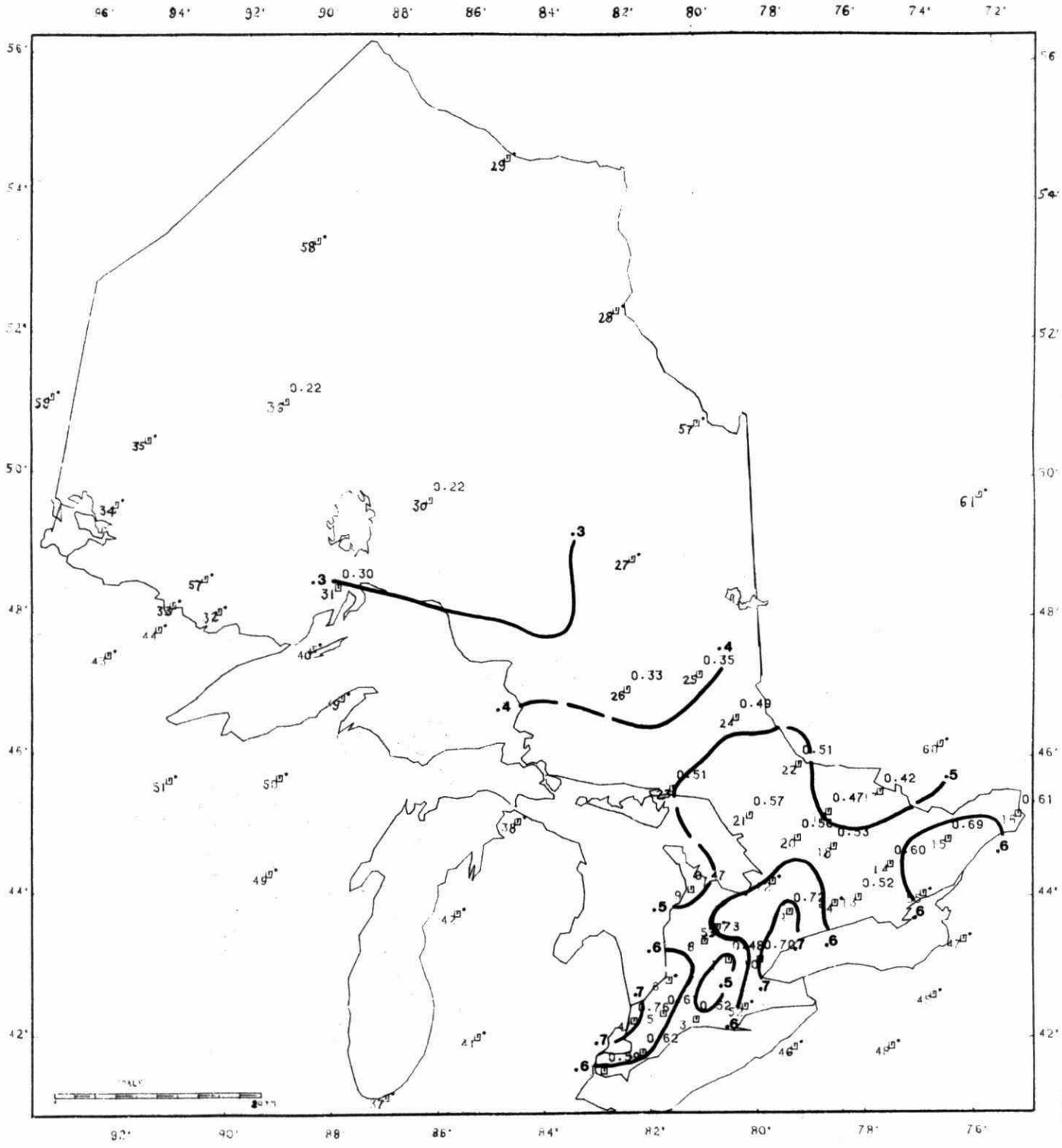

FIGURE 7B. ANNUAL DEPOSITION(G/M••2) OF N-TKN - 1981

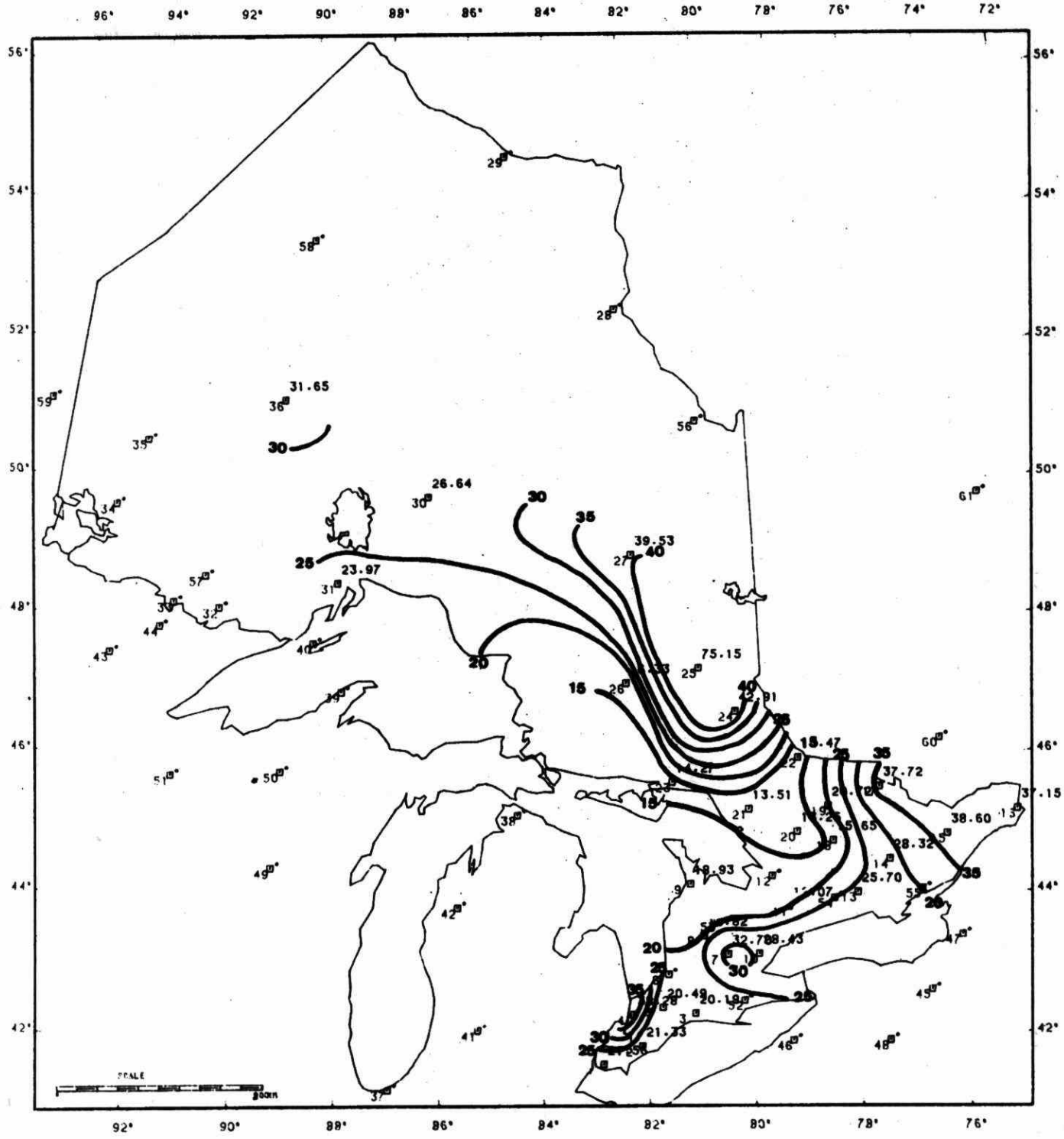

FIGURE 8A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF P-PO4 - 1981

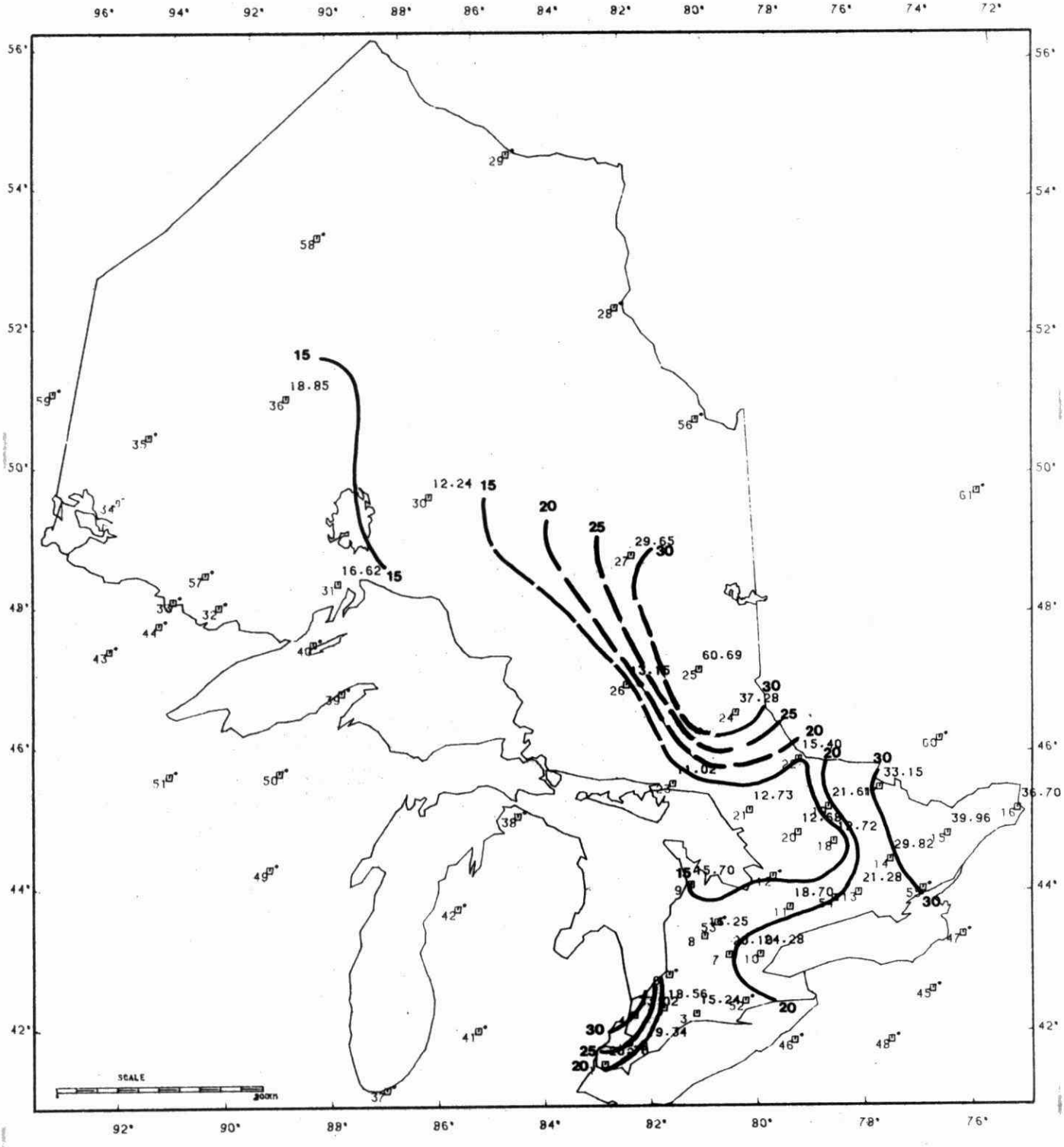

FIGURE 8B. ANNUAL DEPOSITION (MG/M**2) OF P-PO4 - 1981

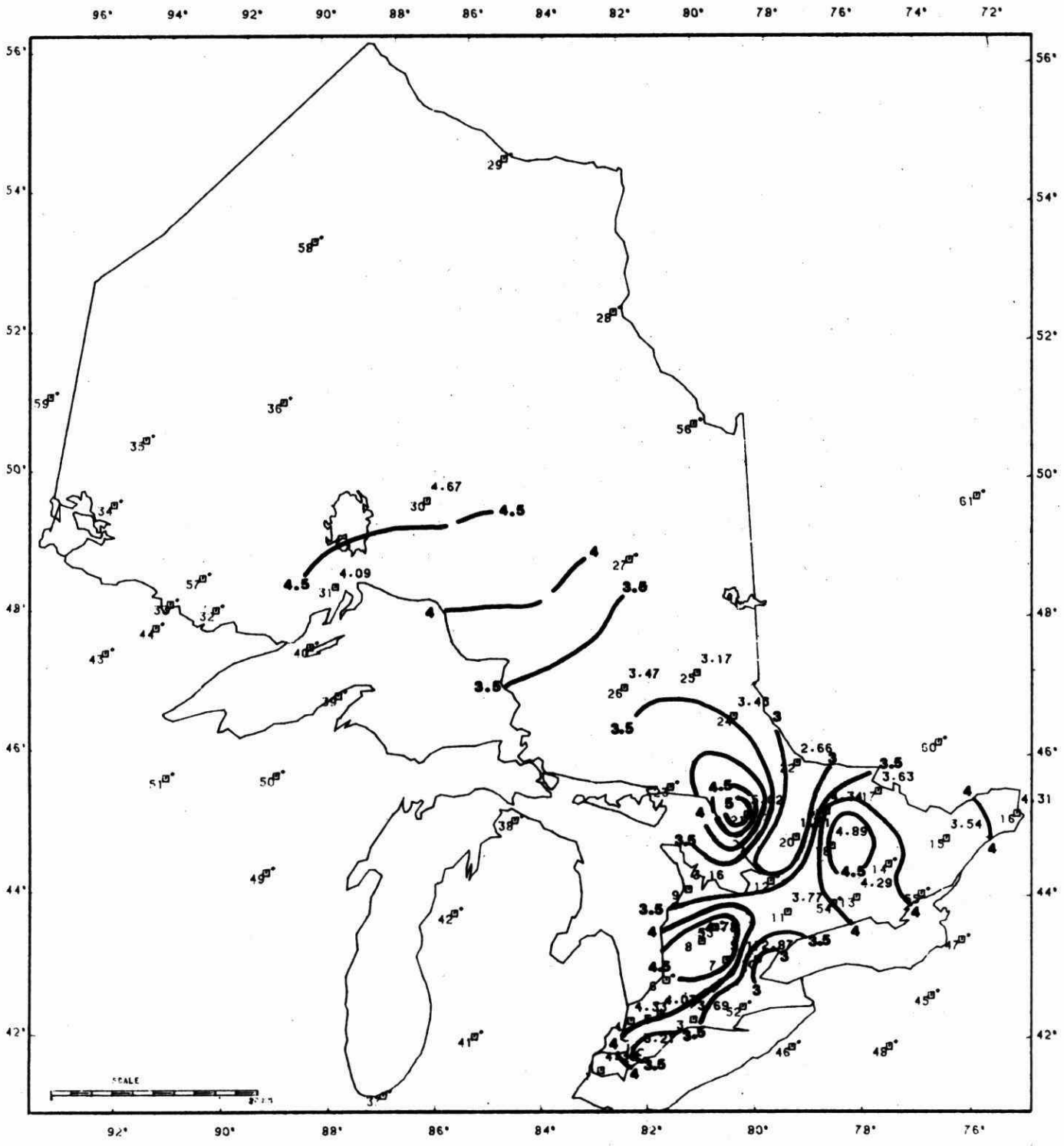

FIGURE 9A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF CU - 1981

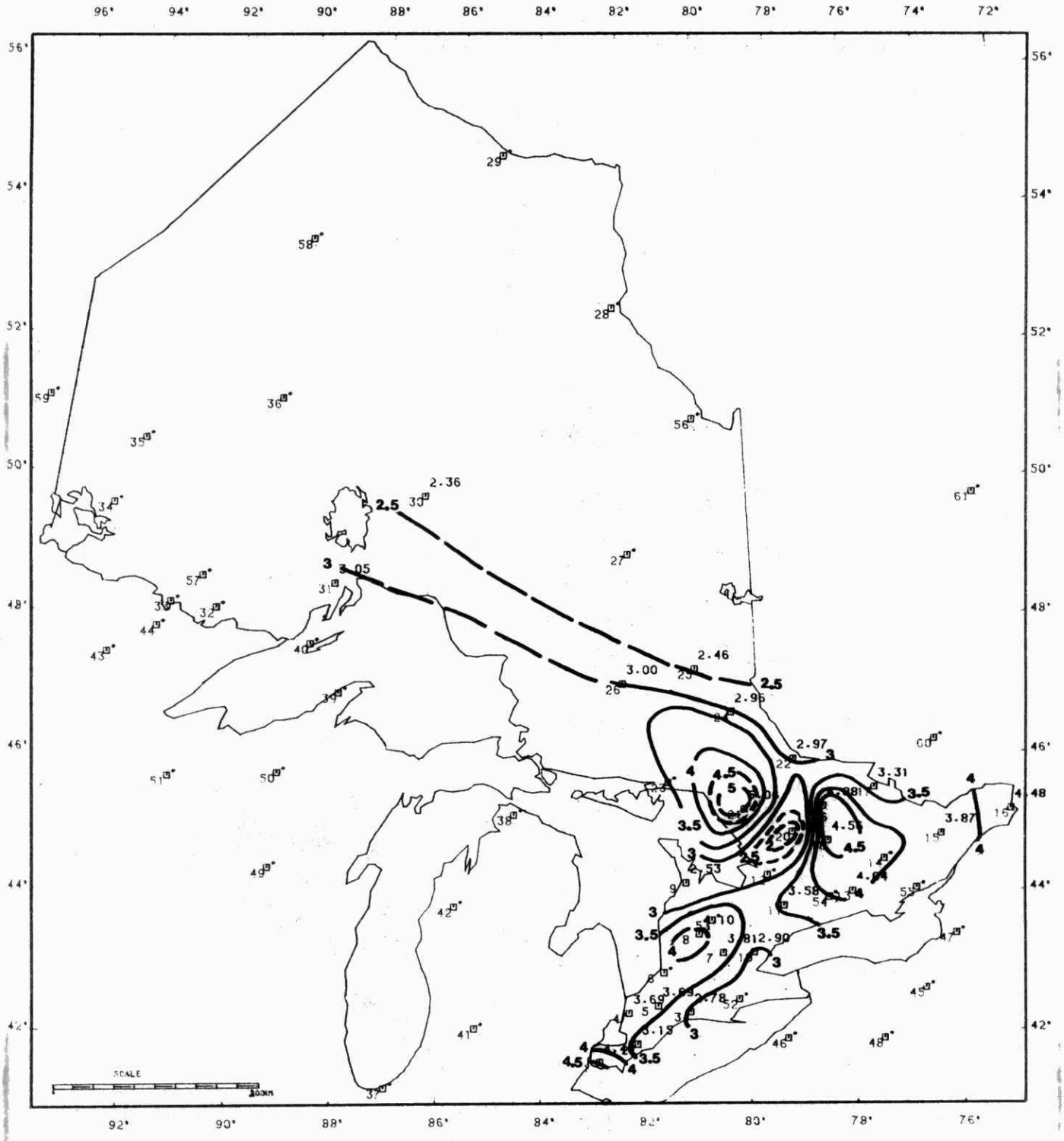

FIGURE 9B. ANNUAL DEPOSITION (MG/M**2) OF CU - 1981

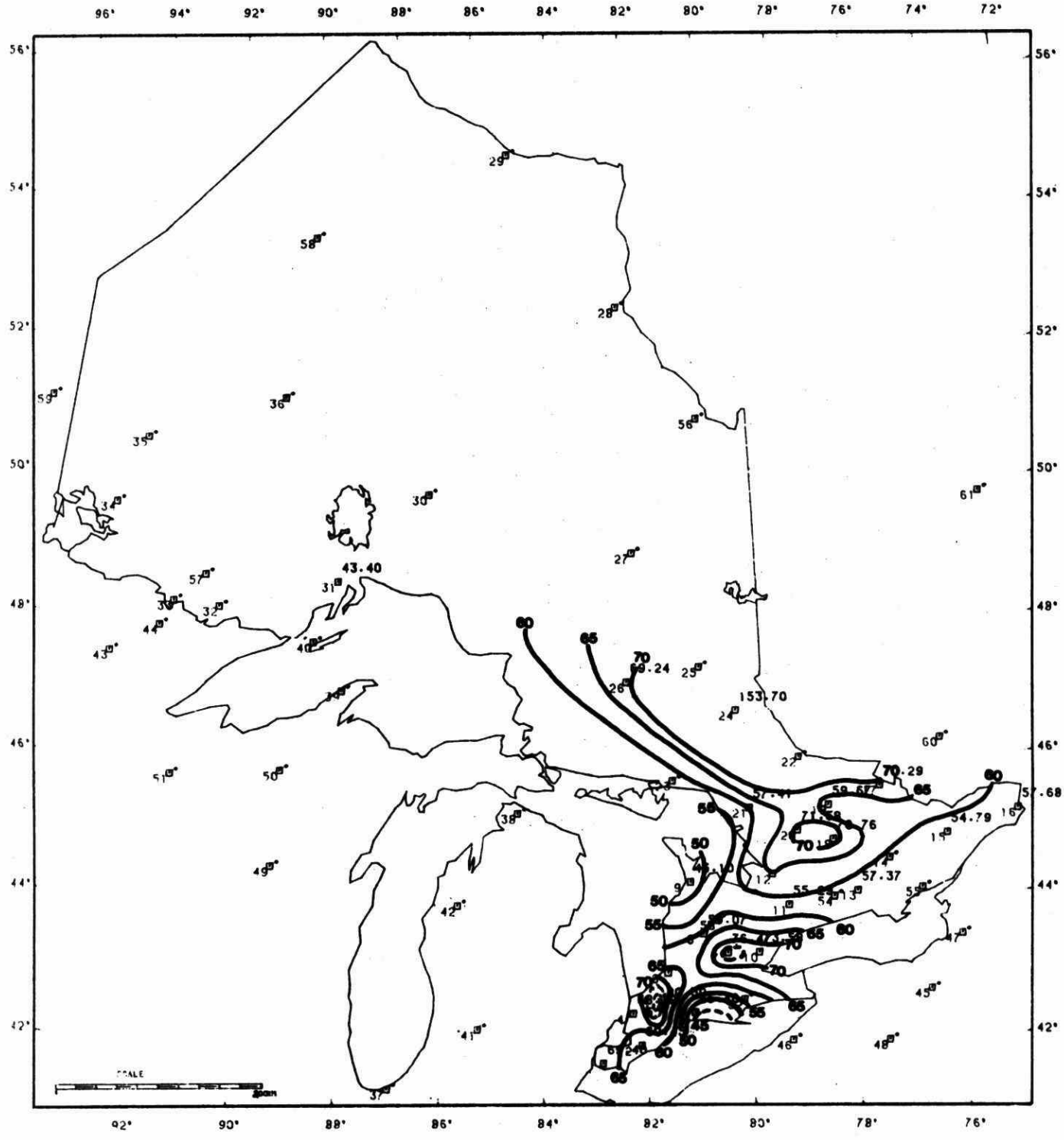

FIGURE 10A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF FE - 1981

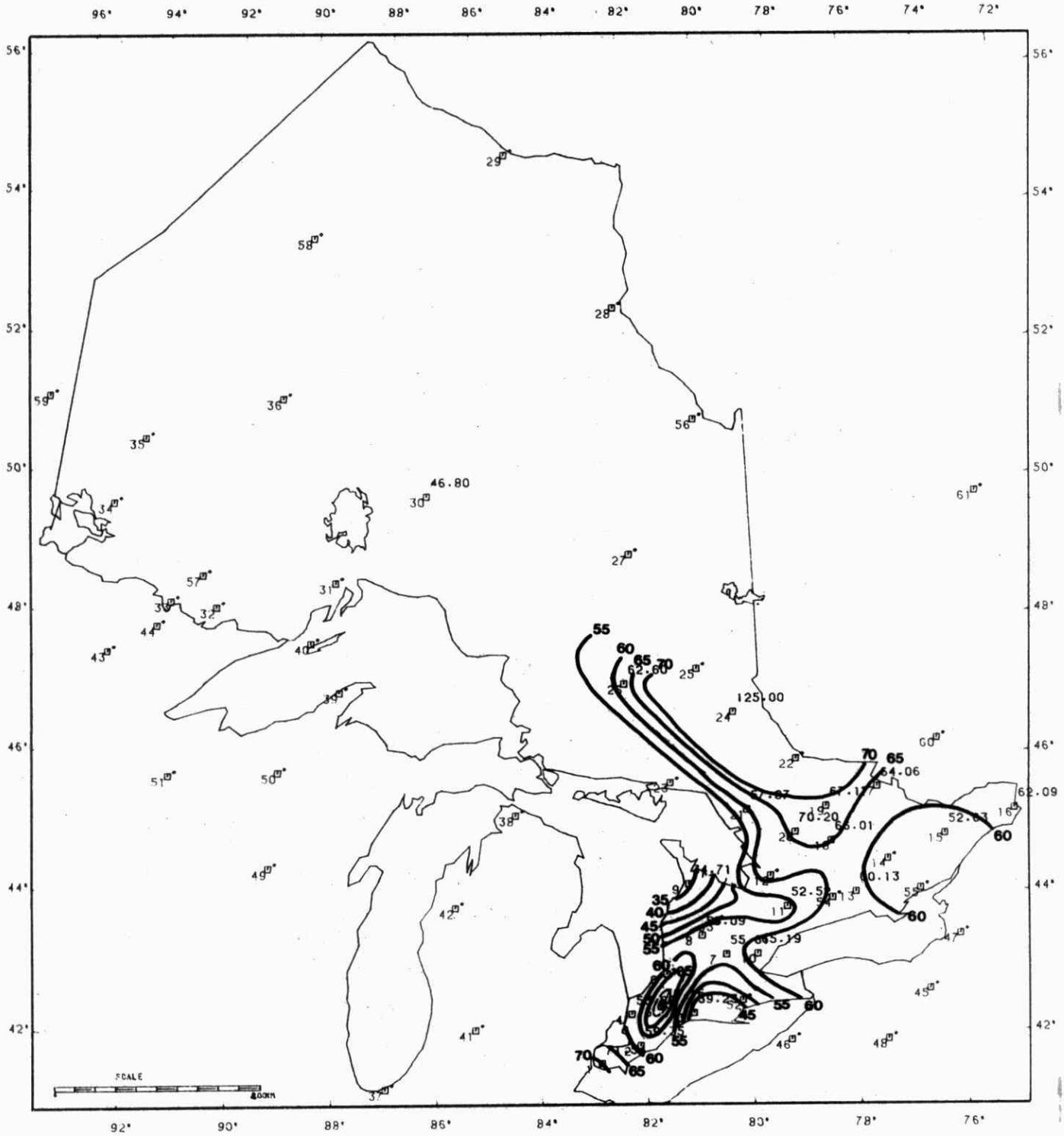

FIGURE 10B. ANNUAL DEPOSITION (MG/M**2) OF FE - 1981

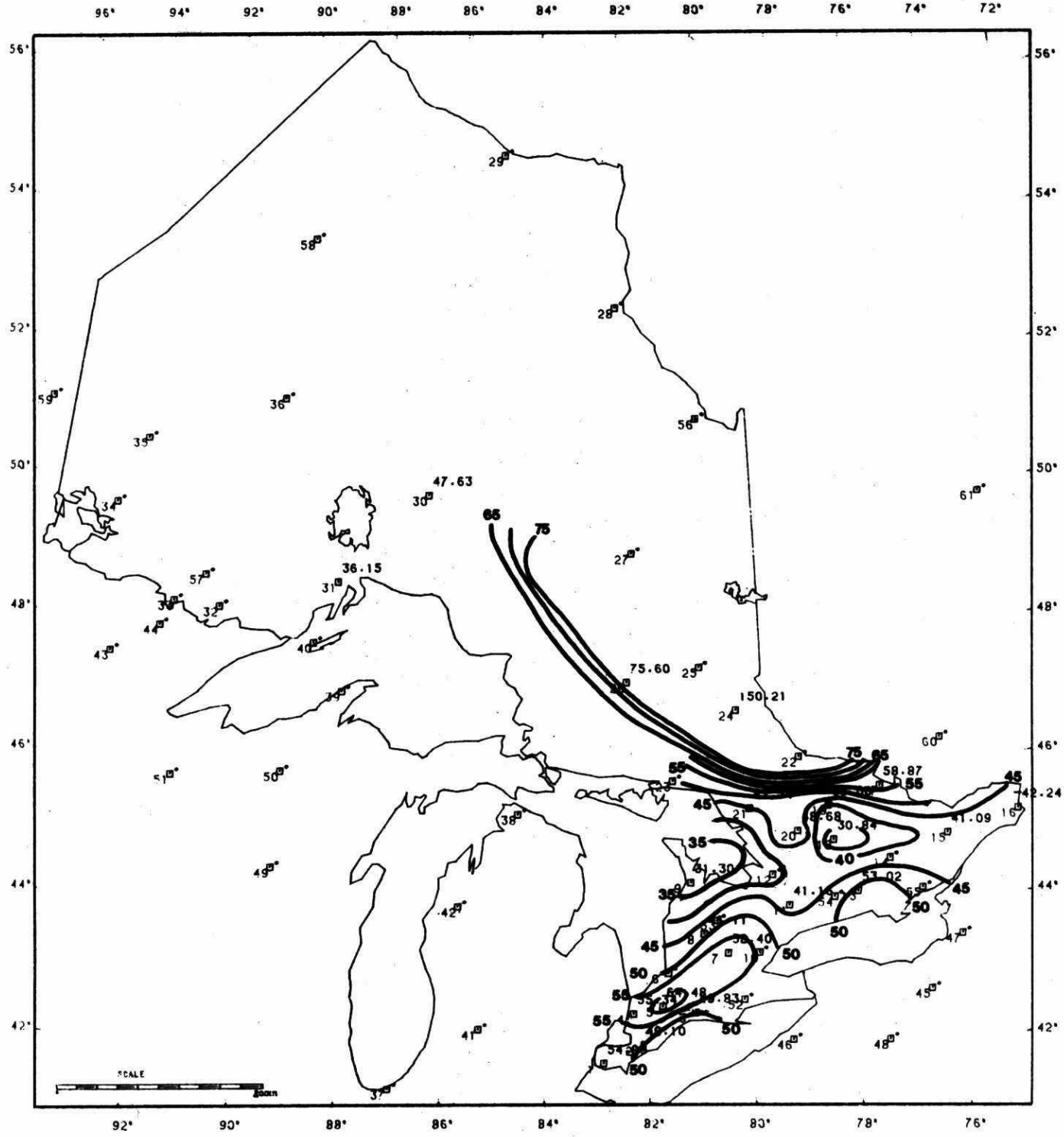

FIGURE 11A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF AL - 1981

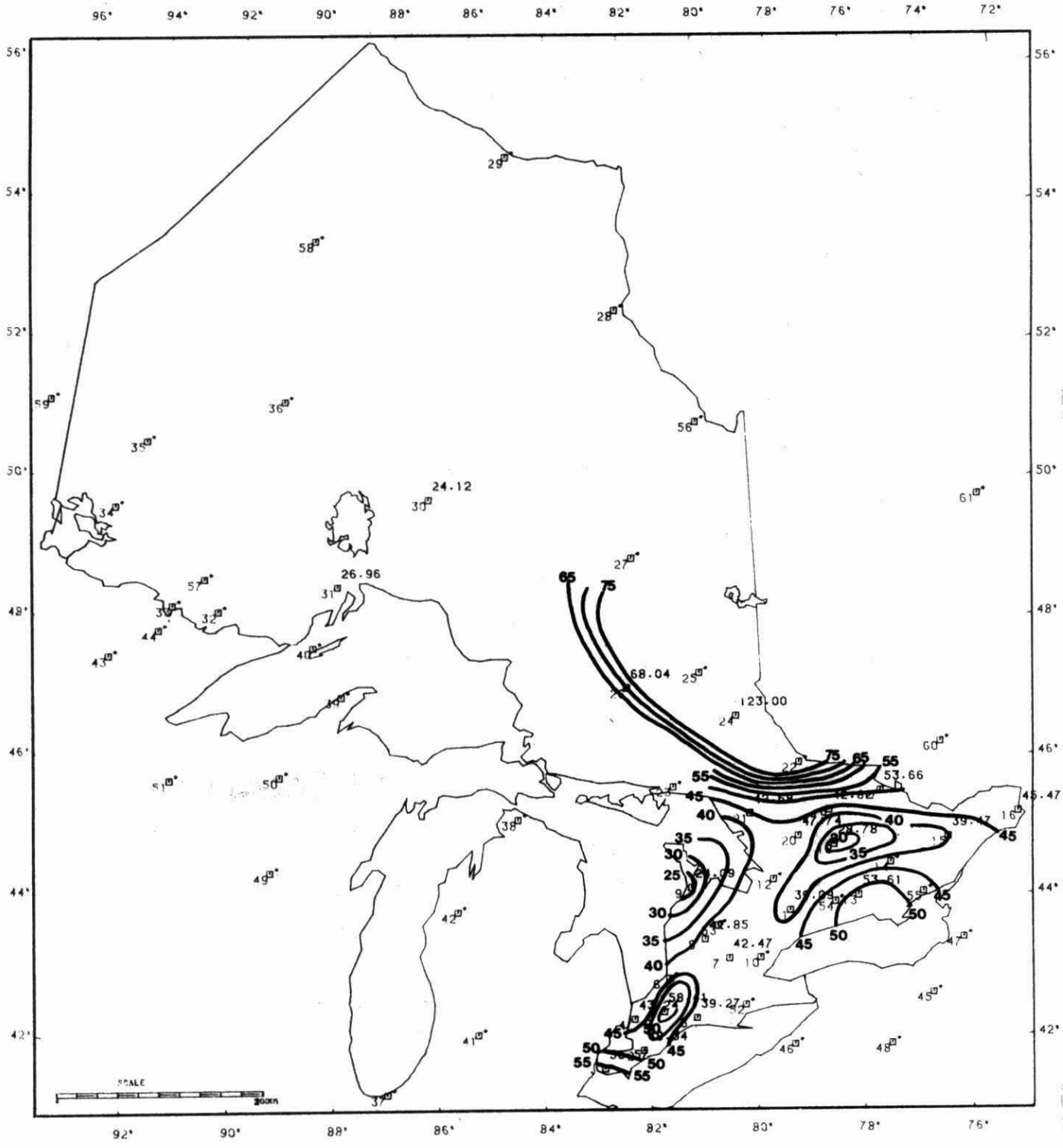

FIGURE 11B. ANNUAL DEPOSITION (MG/M**2) OF AL - 1981

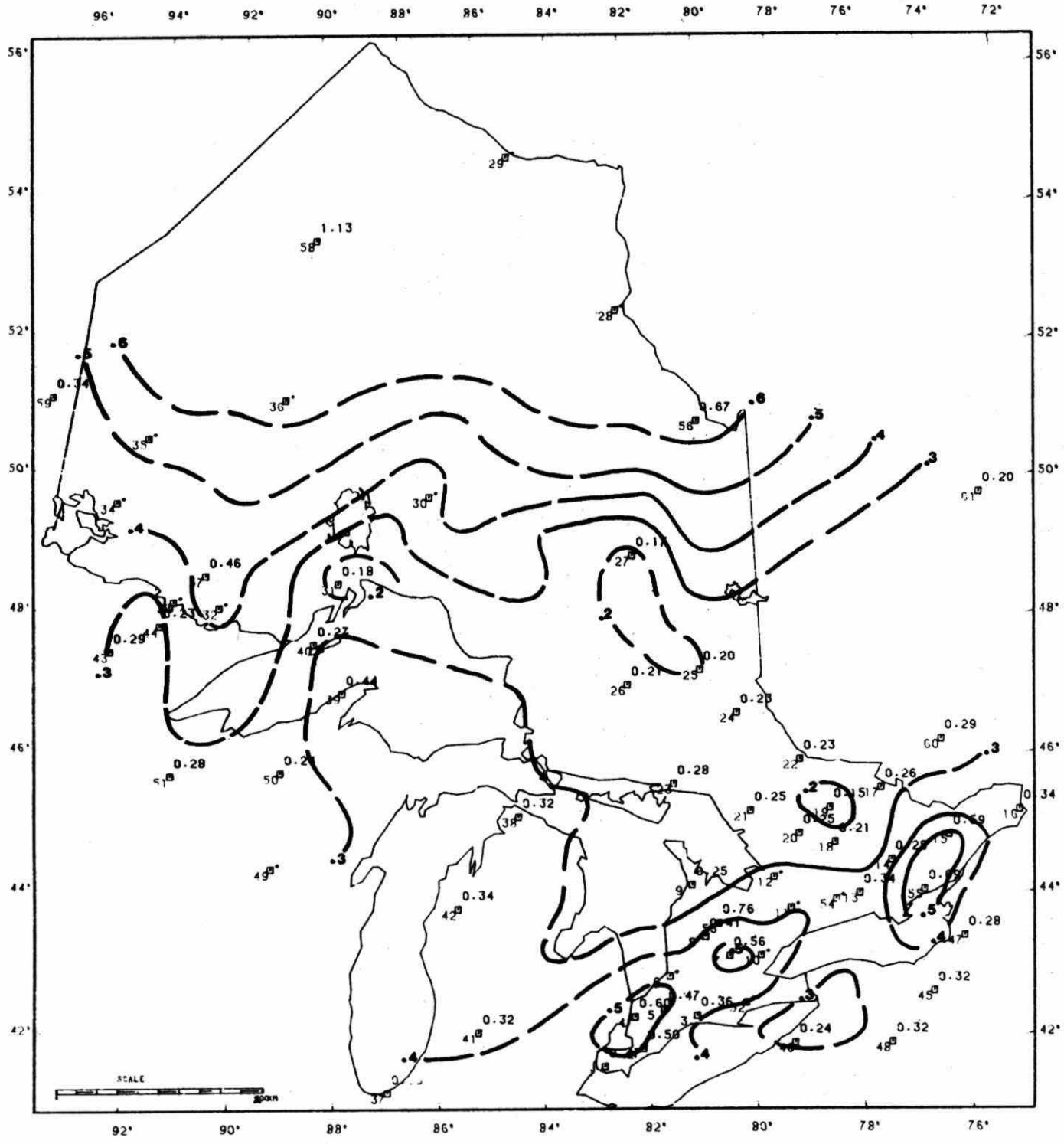

FIGURE 12A. AVERAGED ANNUAL CONCENTRATION (MG/L) OF CA - 1981

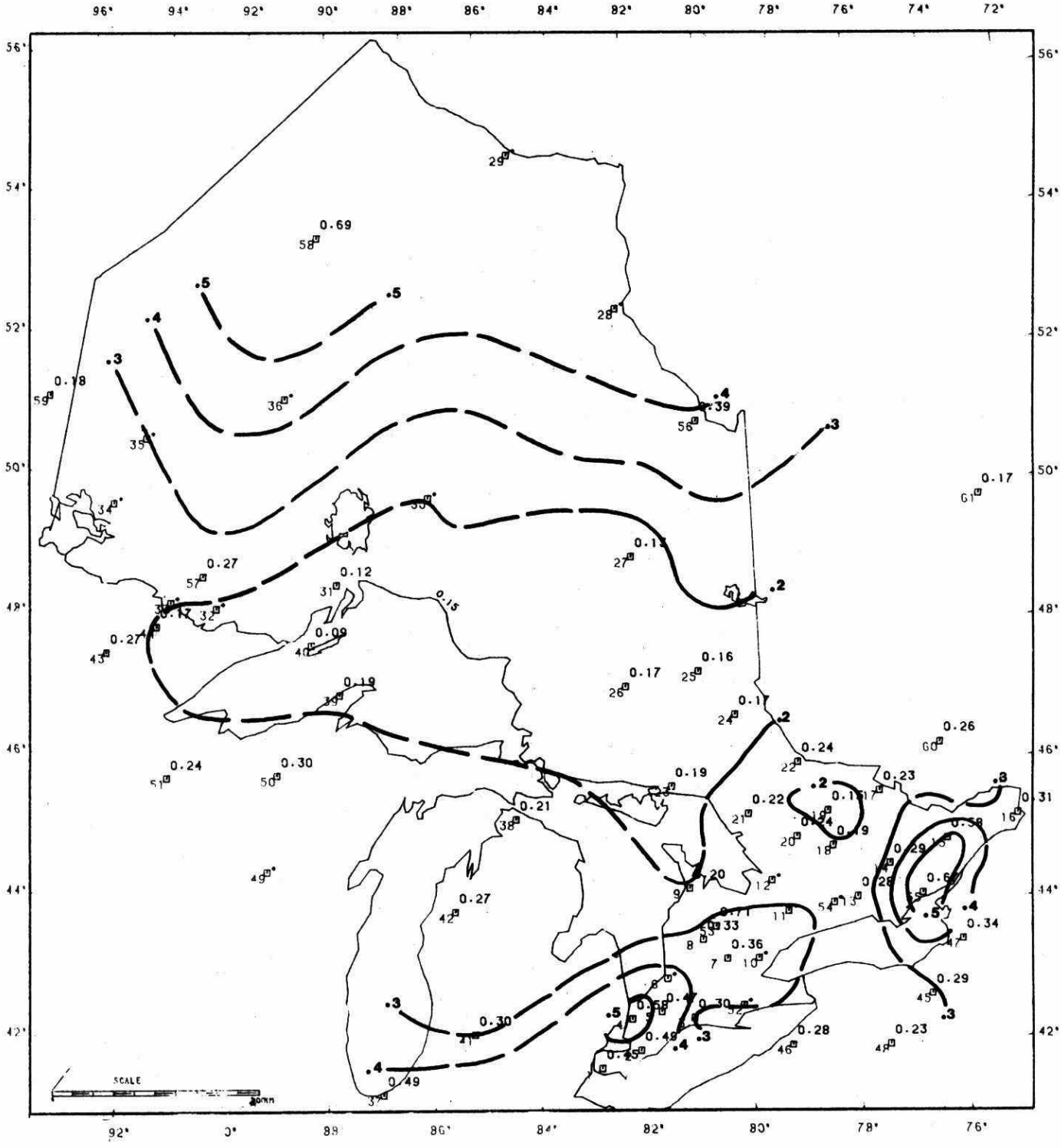

FIGURE 12B. ANNUAL DEPOSITION(G/M**2) OF CA - 1981

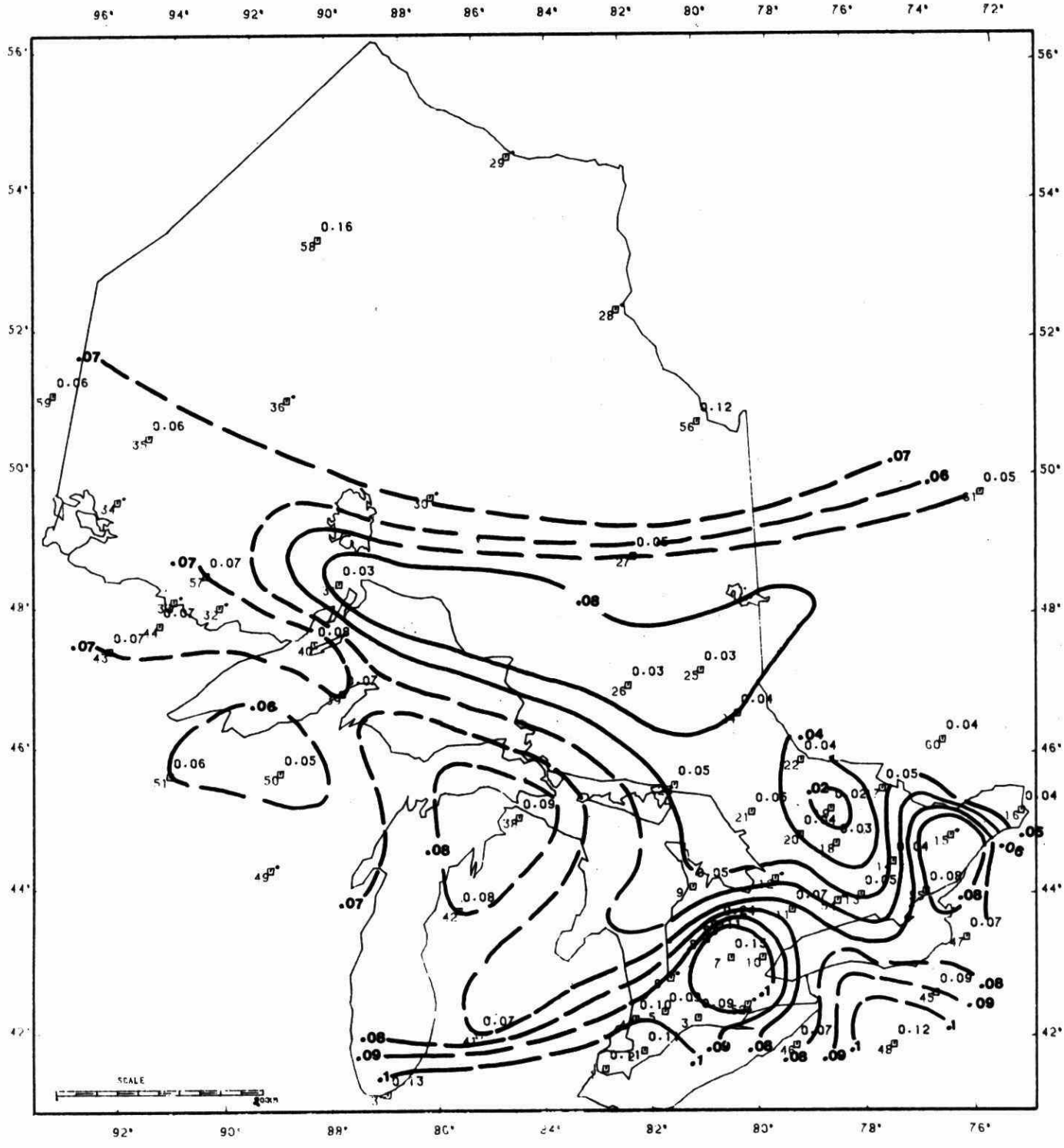

FIGURE 13A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF MG - 1981

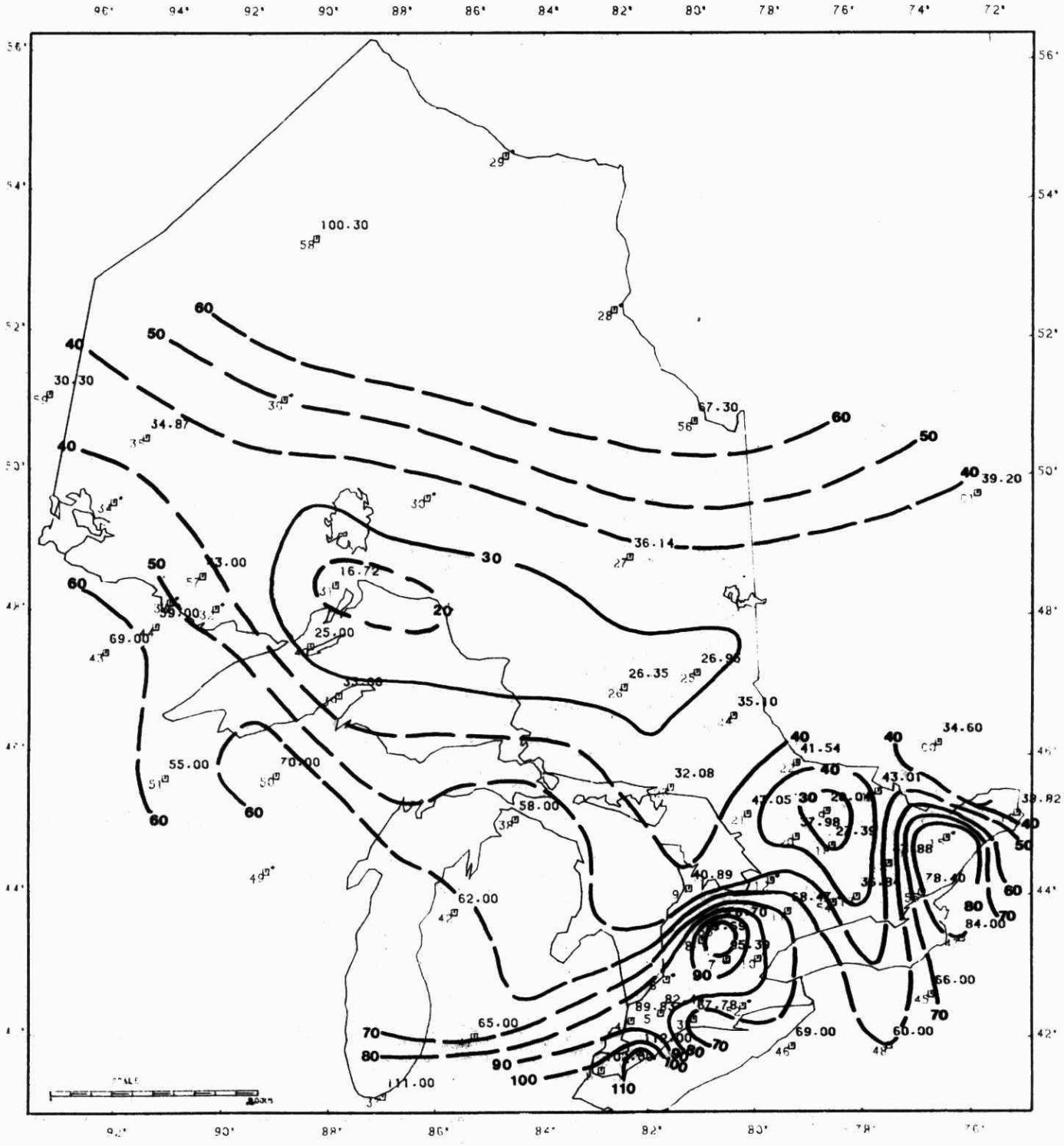

FIGURE 13B ANNUAL DEPOSITION (MG/M**2) OF MG - 1981

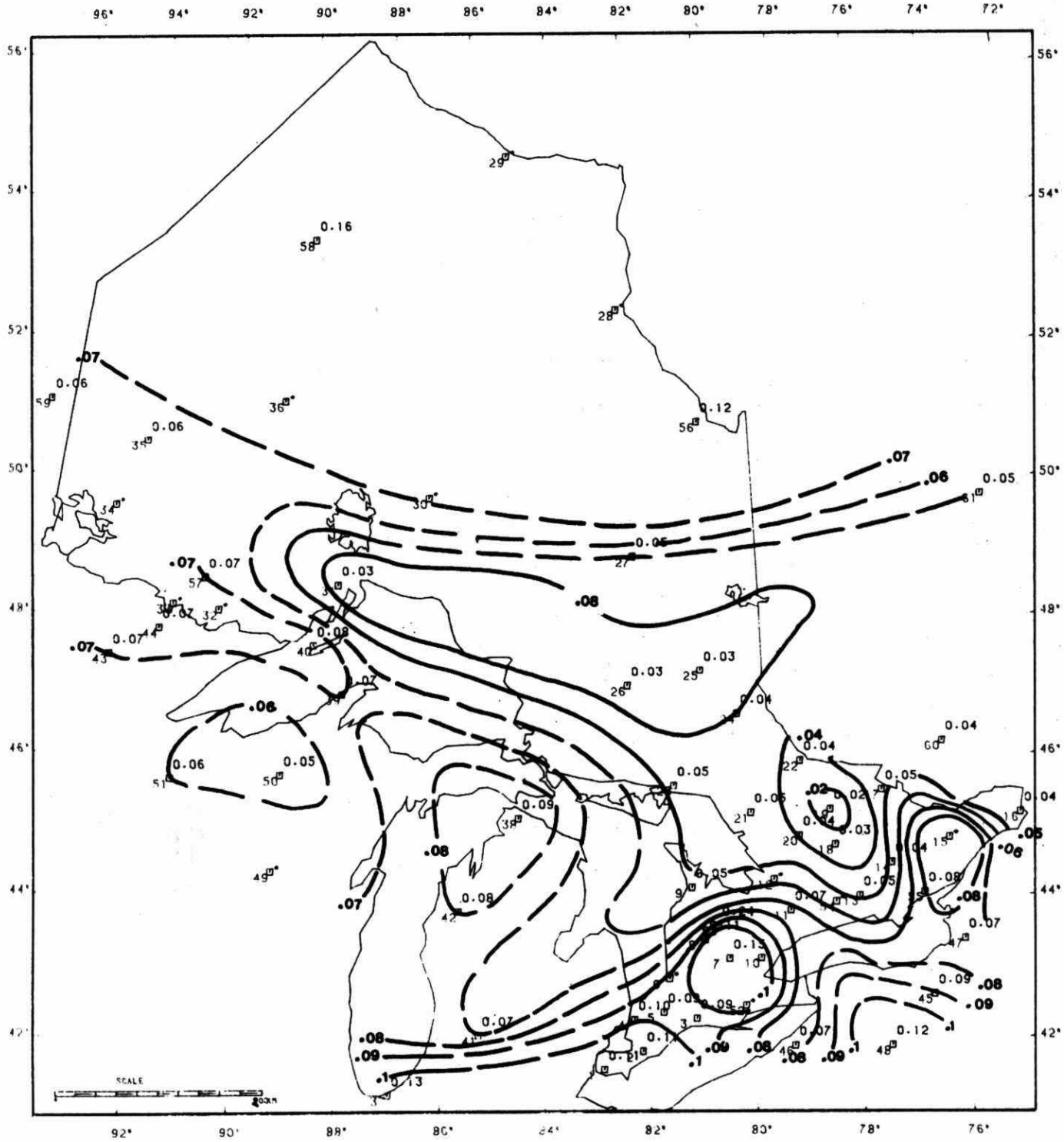

FIGURE 13A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF MG - 1981

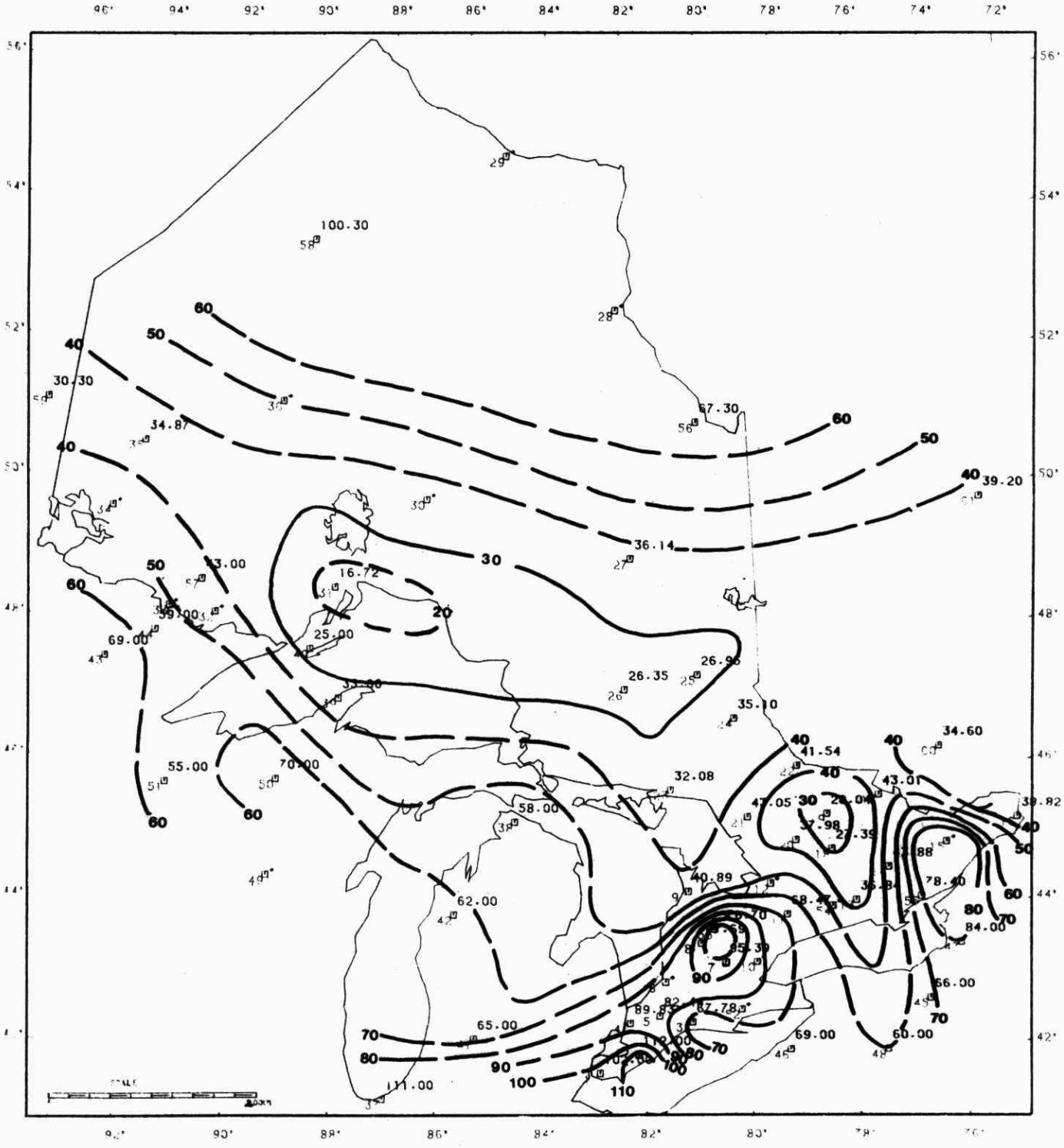

FIGURE 13B ANNUAL DEPOSITION (MG/M**2) OF MG - 1981

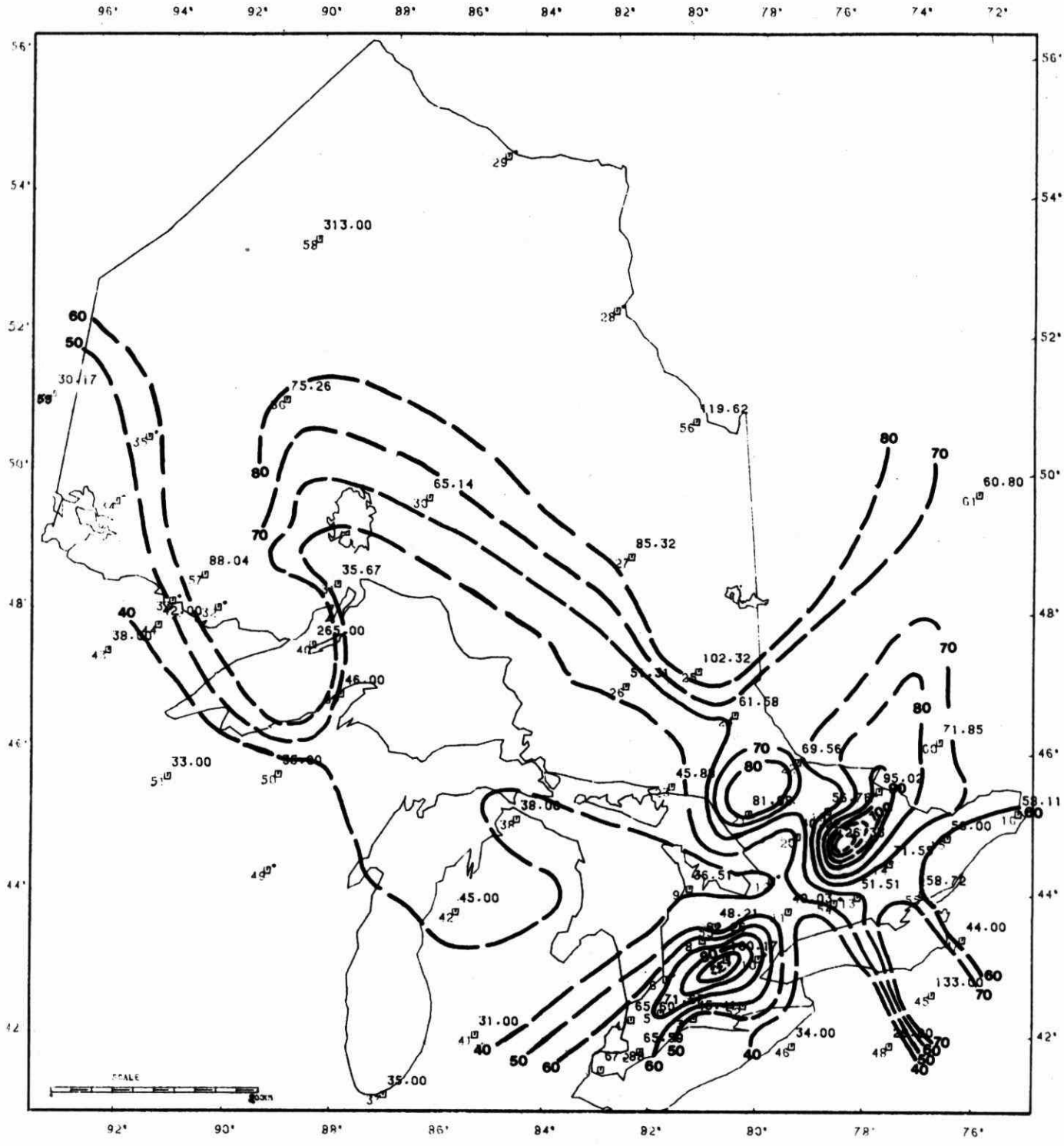

FIGURE 14A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF K - 1981

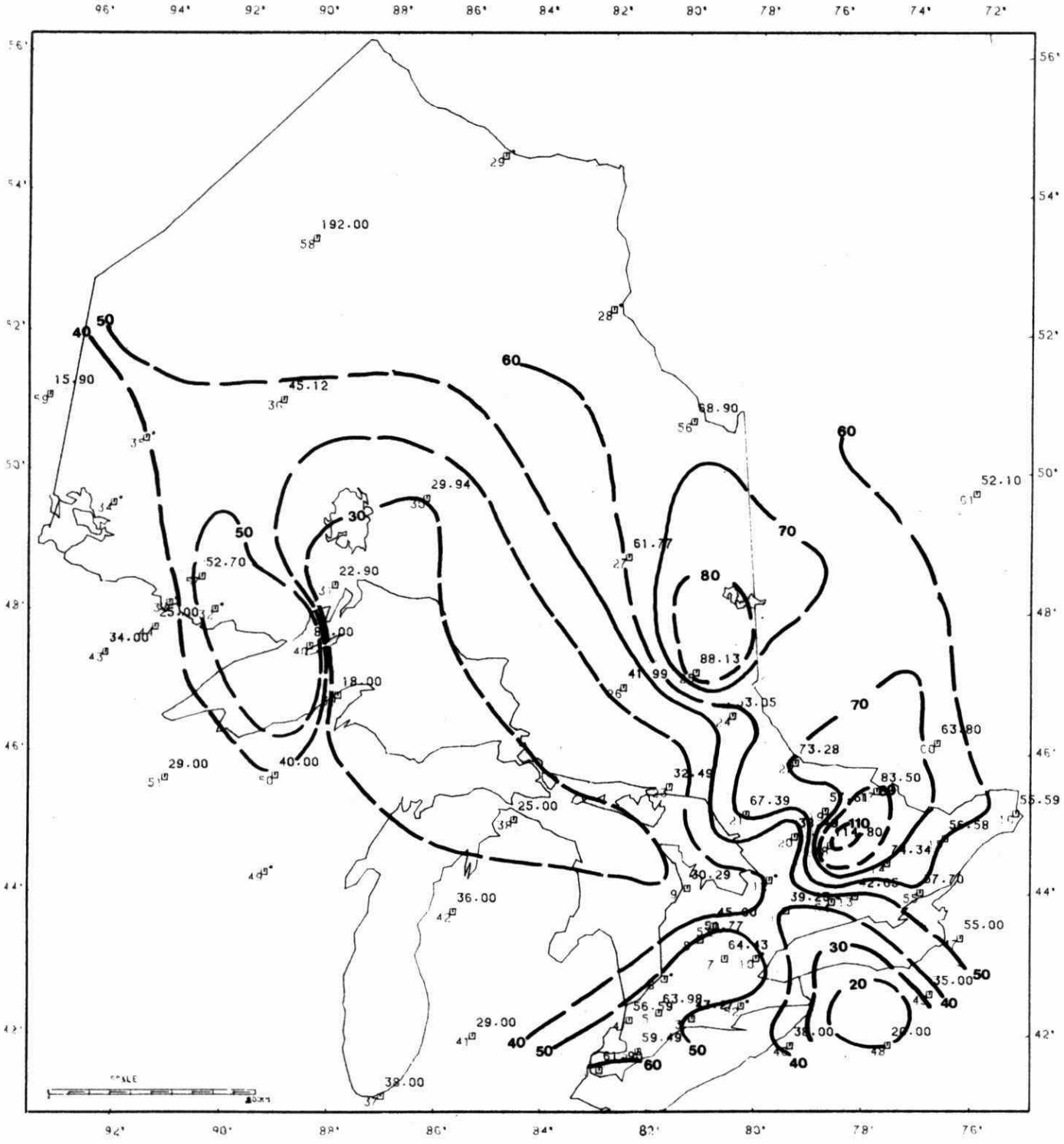

FIGURE 14B. ANNUAL DEPOSITION (MG/M**2) OF K - 1981

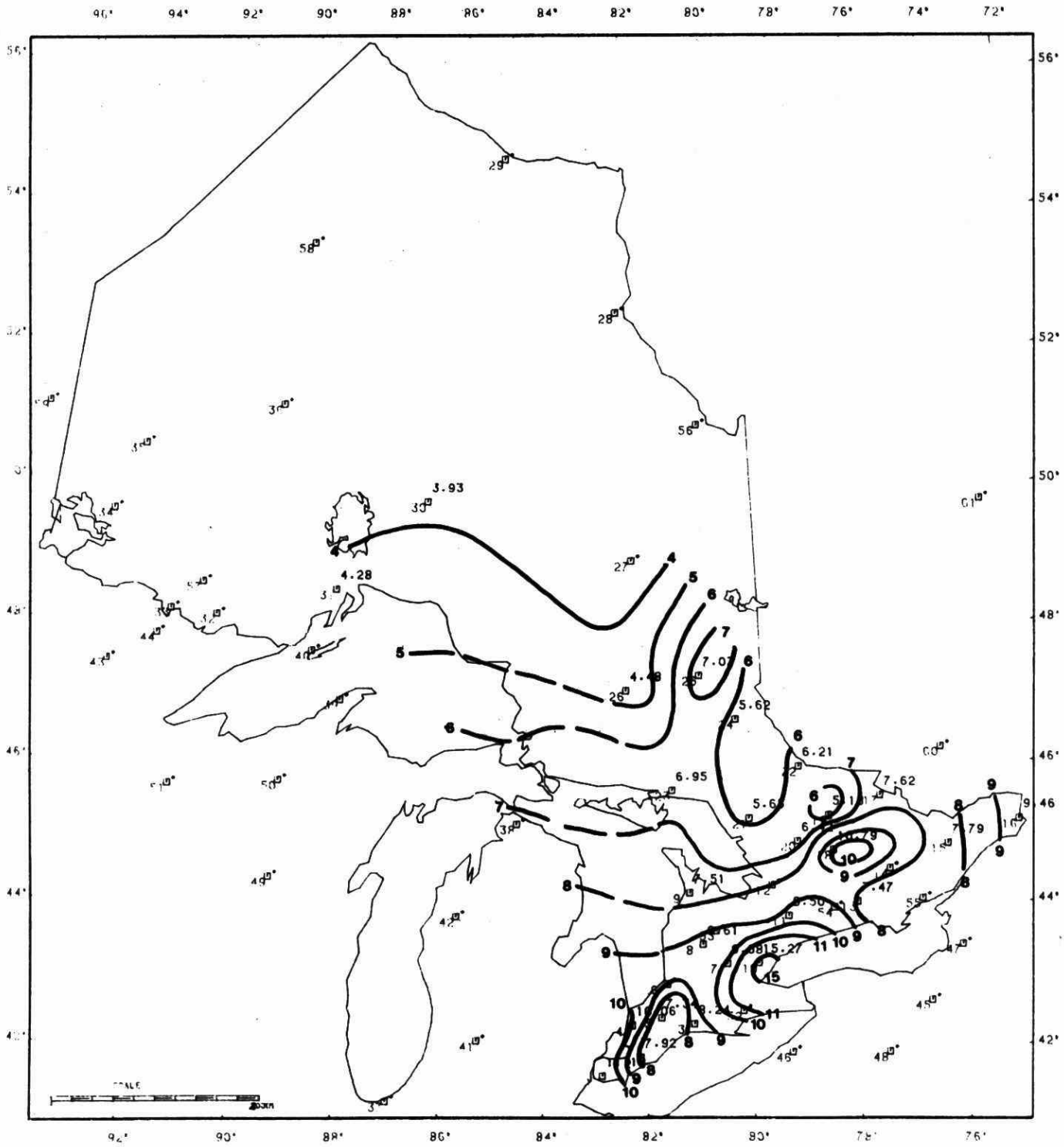

FIGURE 15A. AVERAGED ANNUAL CONCENTRATION (UG/L) OF PB - 1981

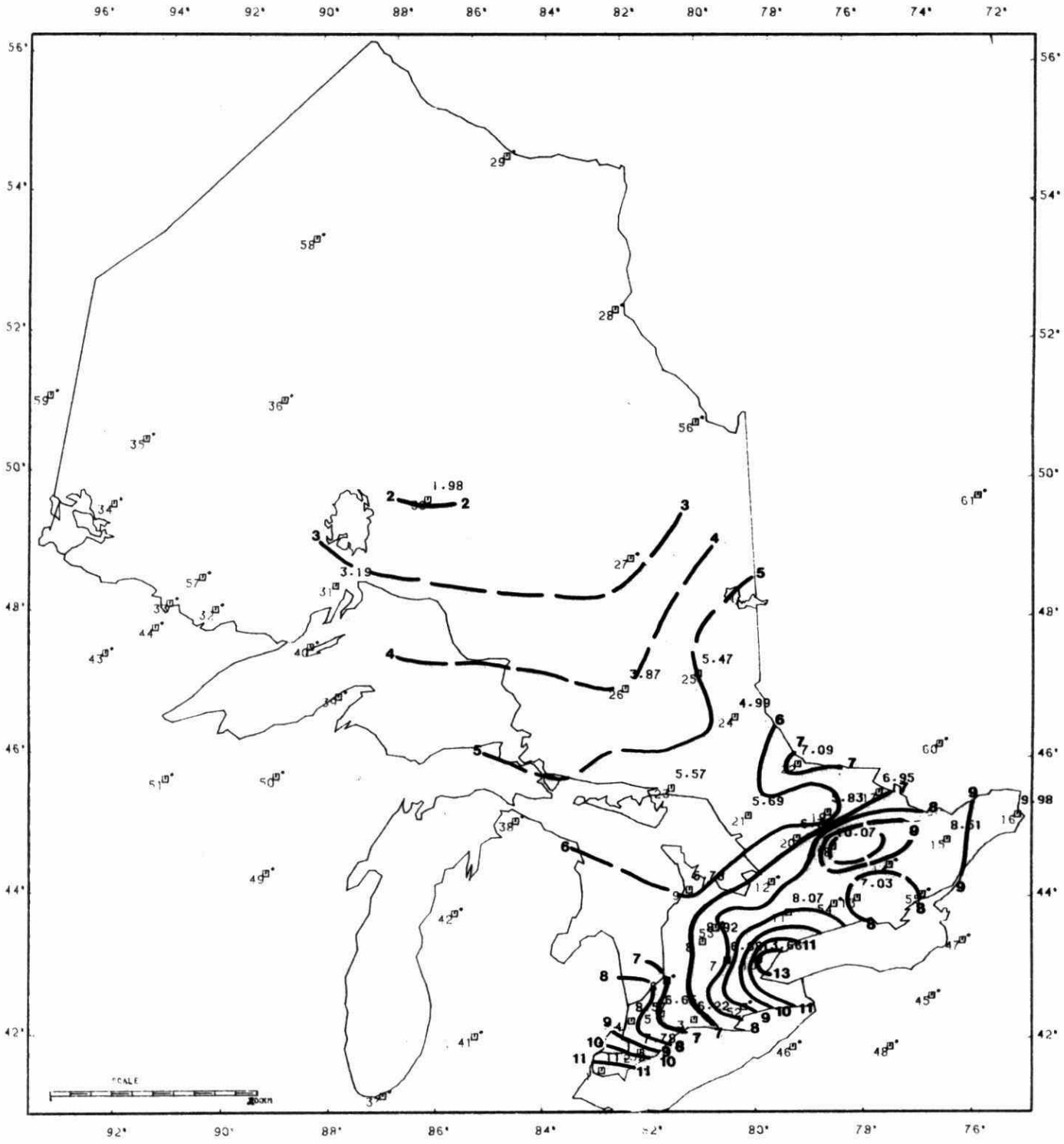

FIGURE 15B. ANNUAL DEPOSITION (MG/M**2) OF PB - 1981

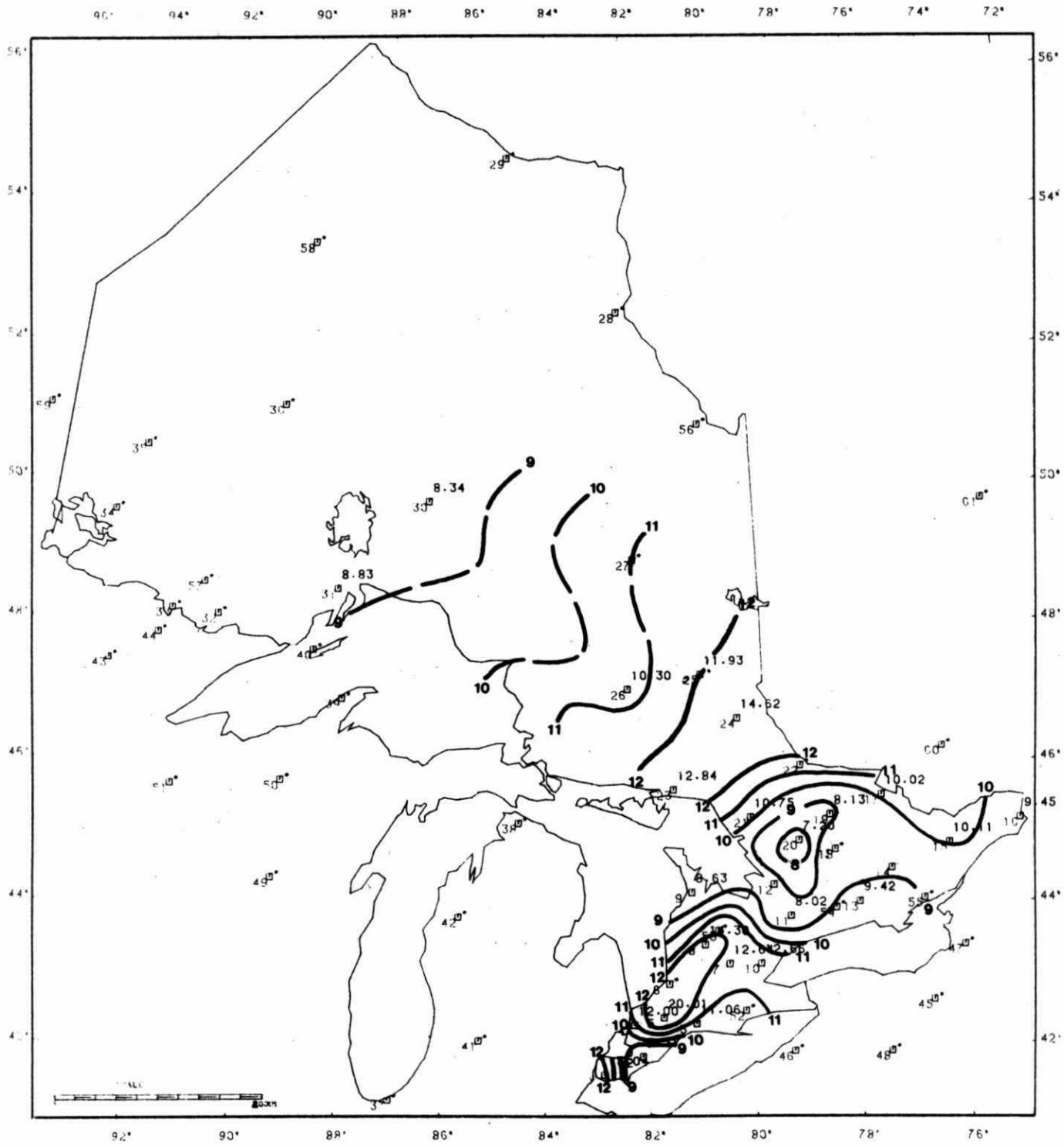

FIGURE 16A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF ZN - 1981

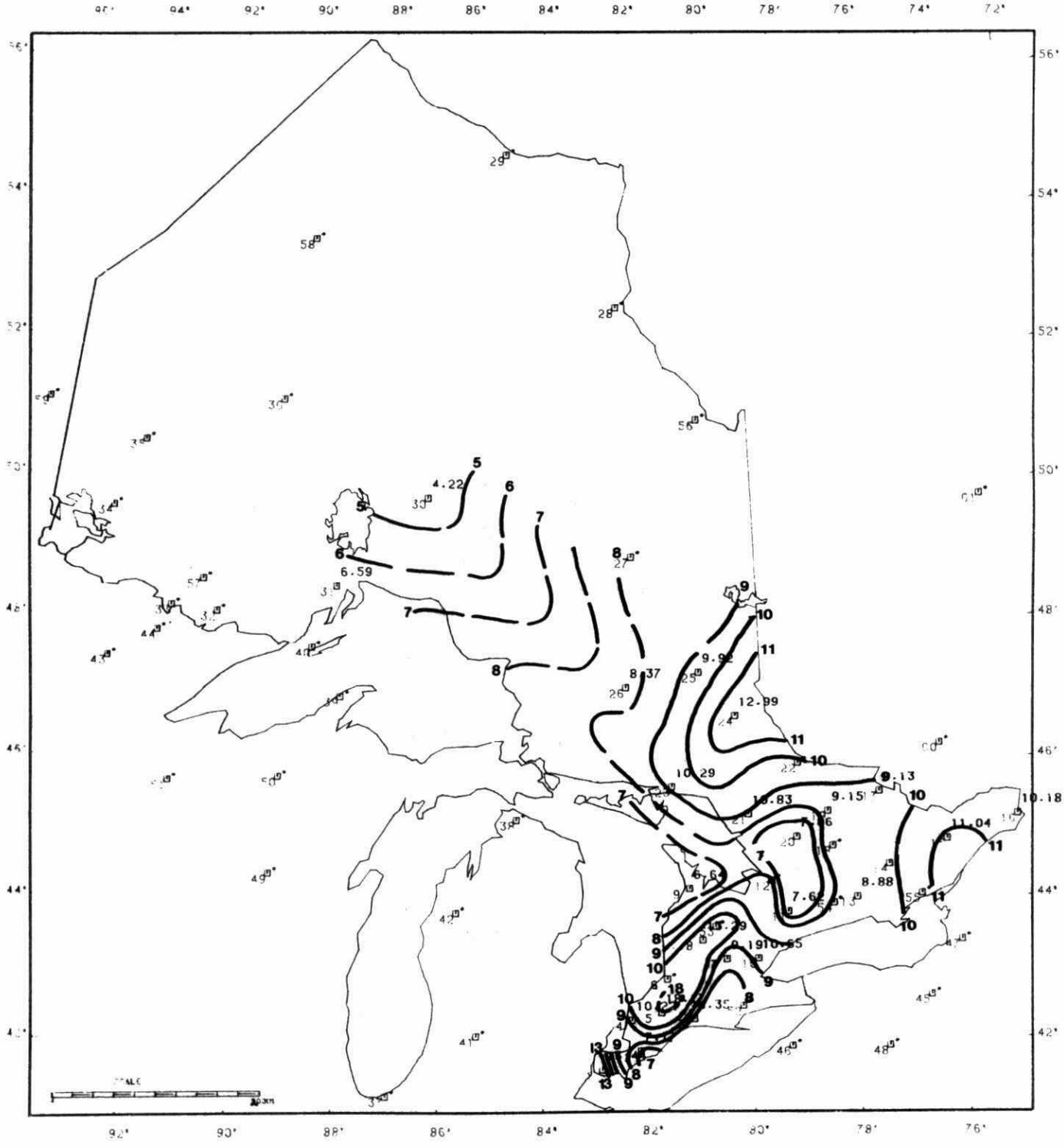

FIGURE 16B. ANNUAL DEPOSITION (MG/M**2) OF ZN - 1981

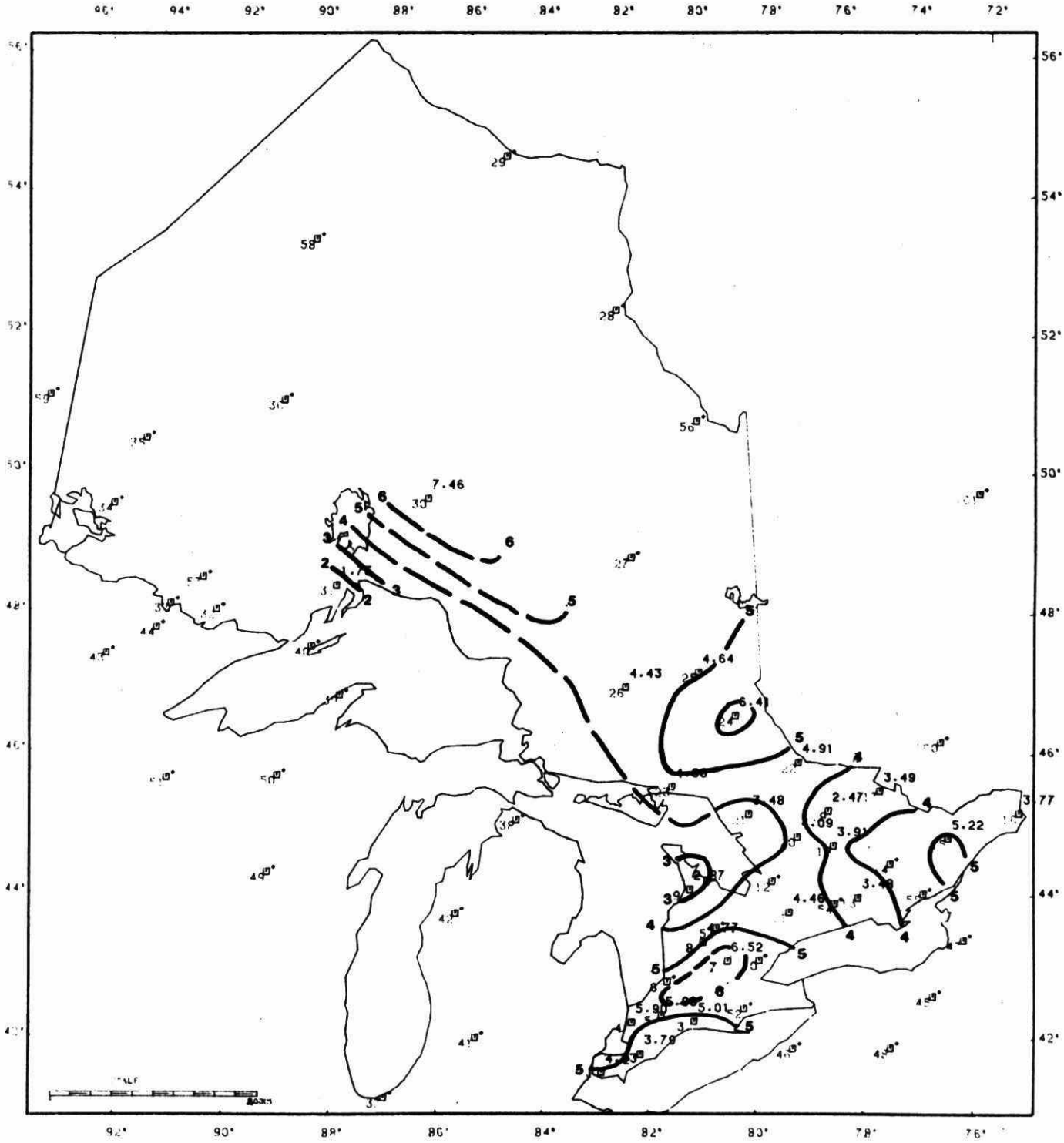

FIGURE 17A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF MN - 1981

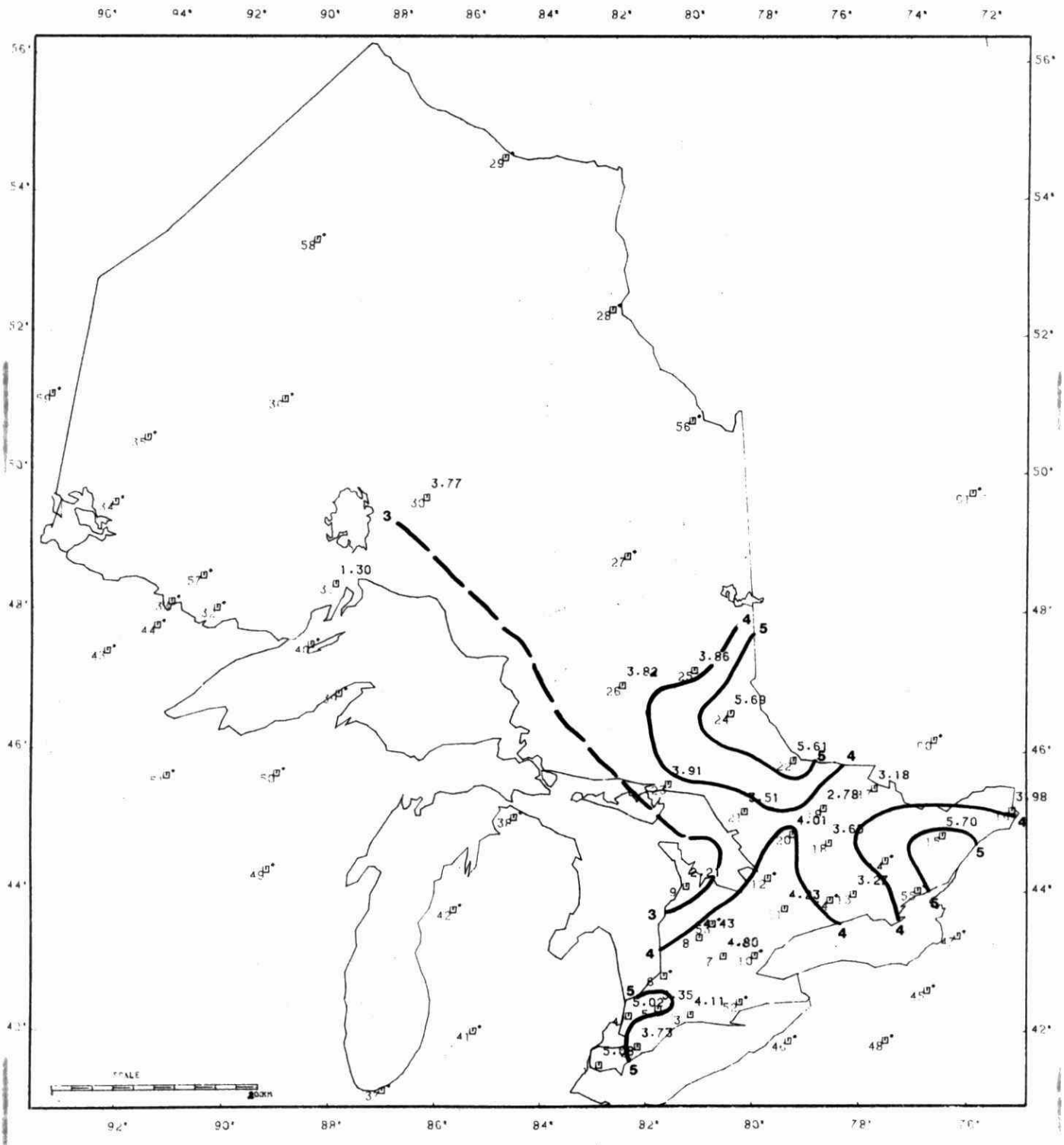

FIGURE 17B. ANNUAL DEPOSITION (MG/M**2) OF MN - 1981

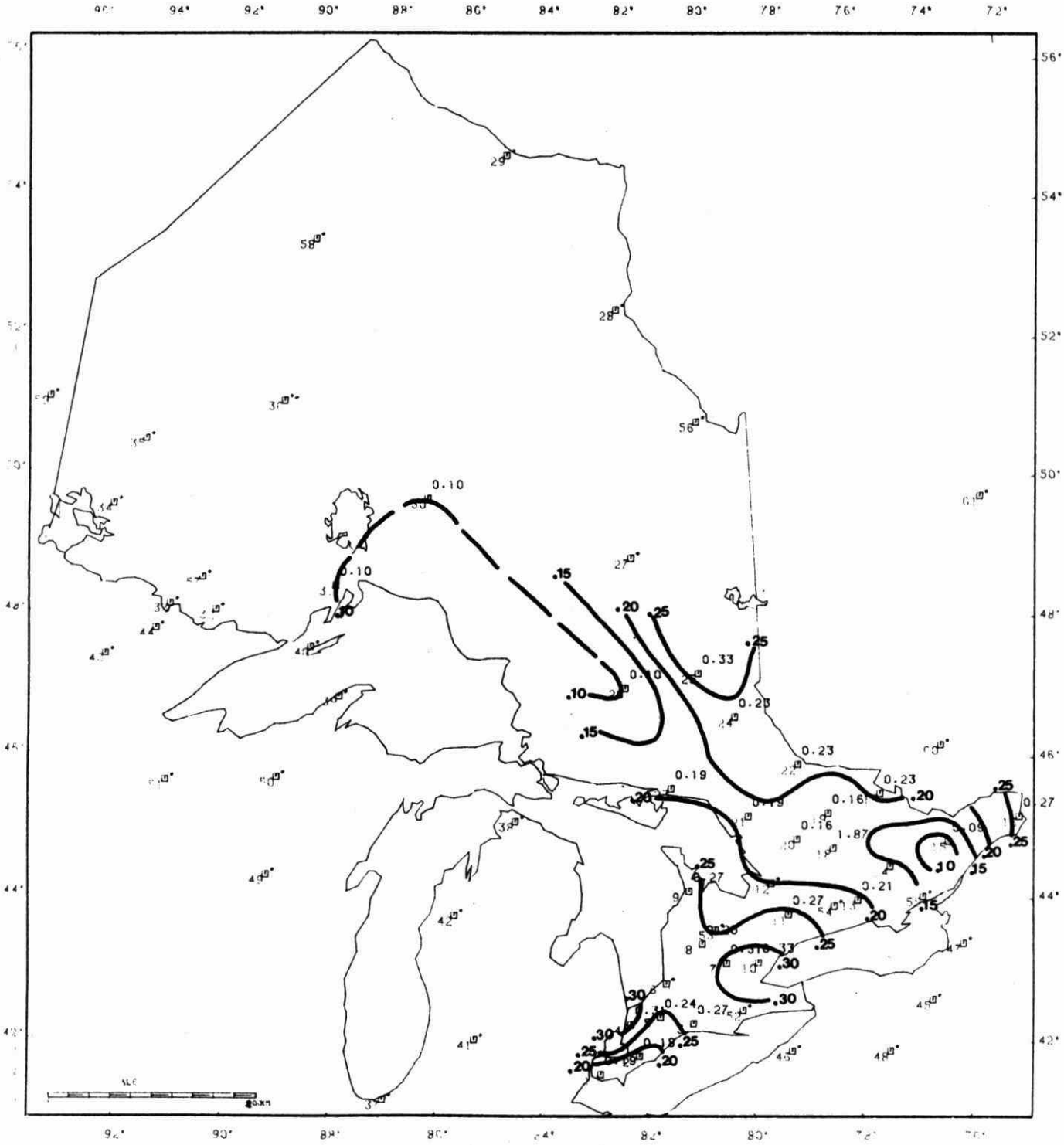

FIGURE 18A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF CD - 1981

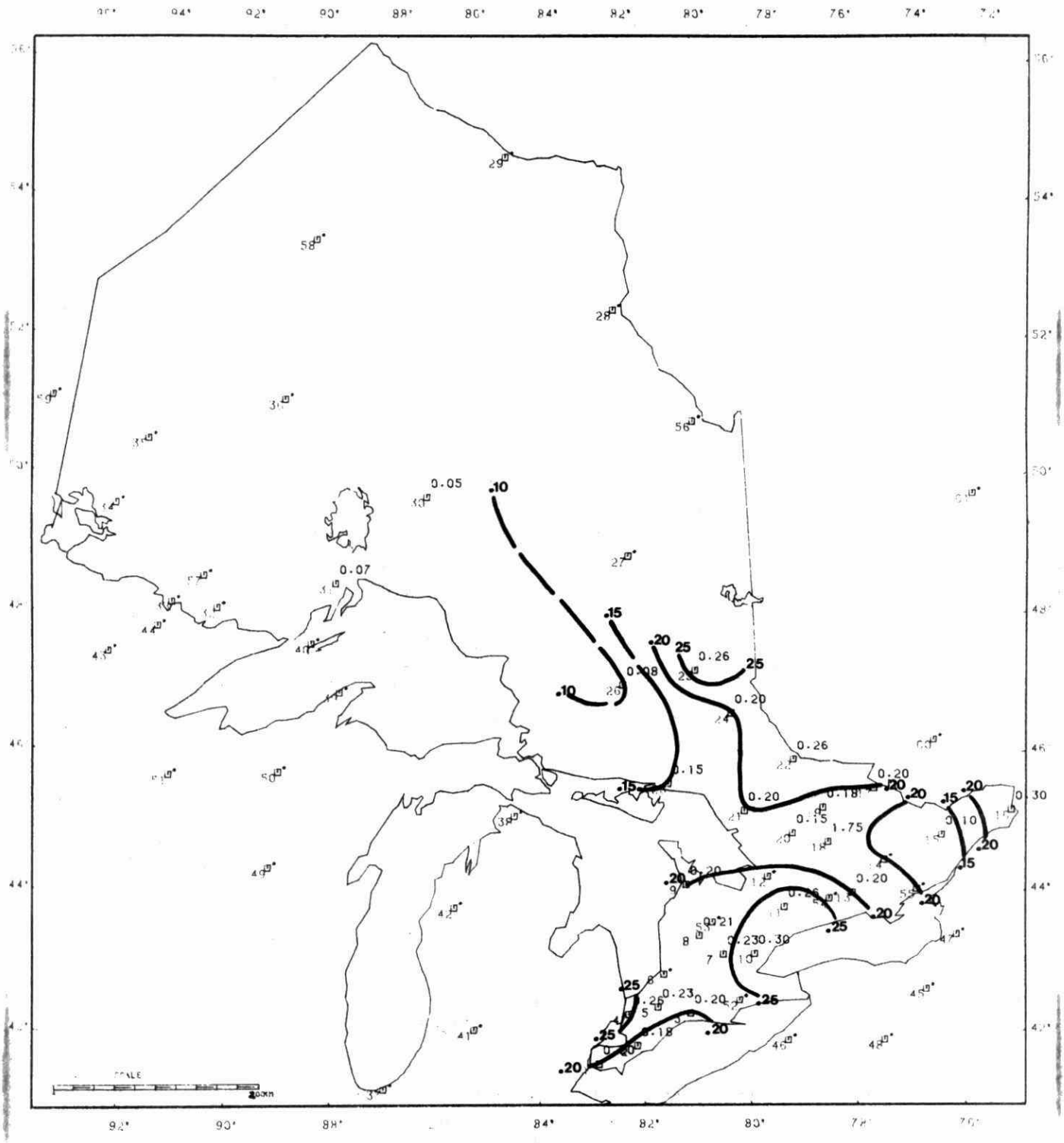

FIGURE 18B. ANNUAL DEPOSITION (MG/M**2) OF CD - 1981

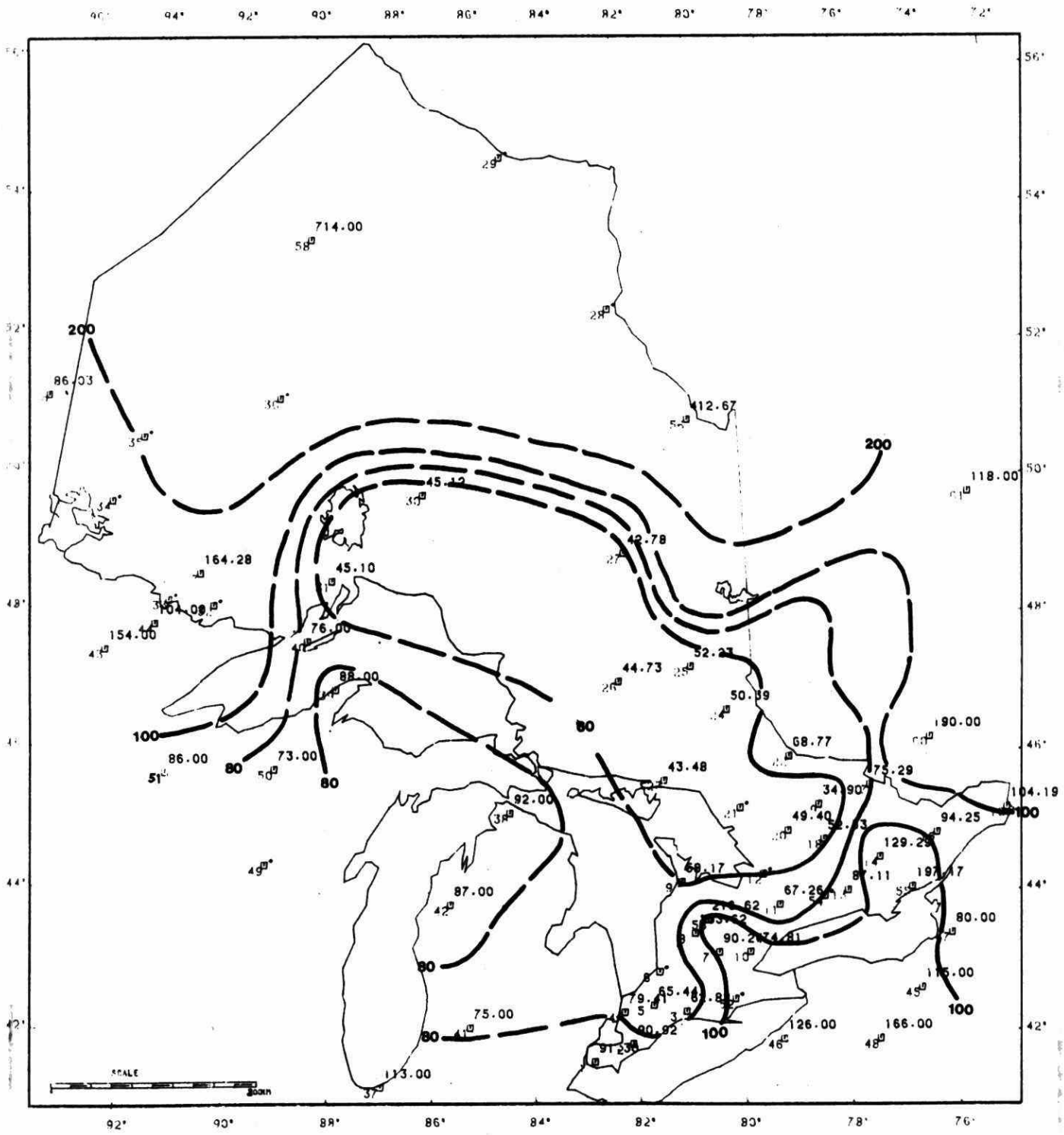

FIGURE 19A. AVERAGED ANNUAL CONCENTRATON (UG/L) OF NA - 1981

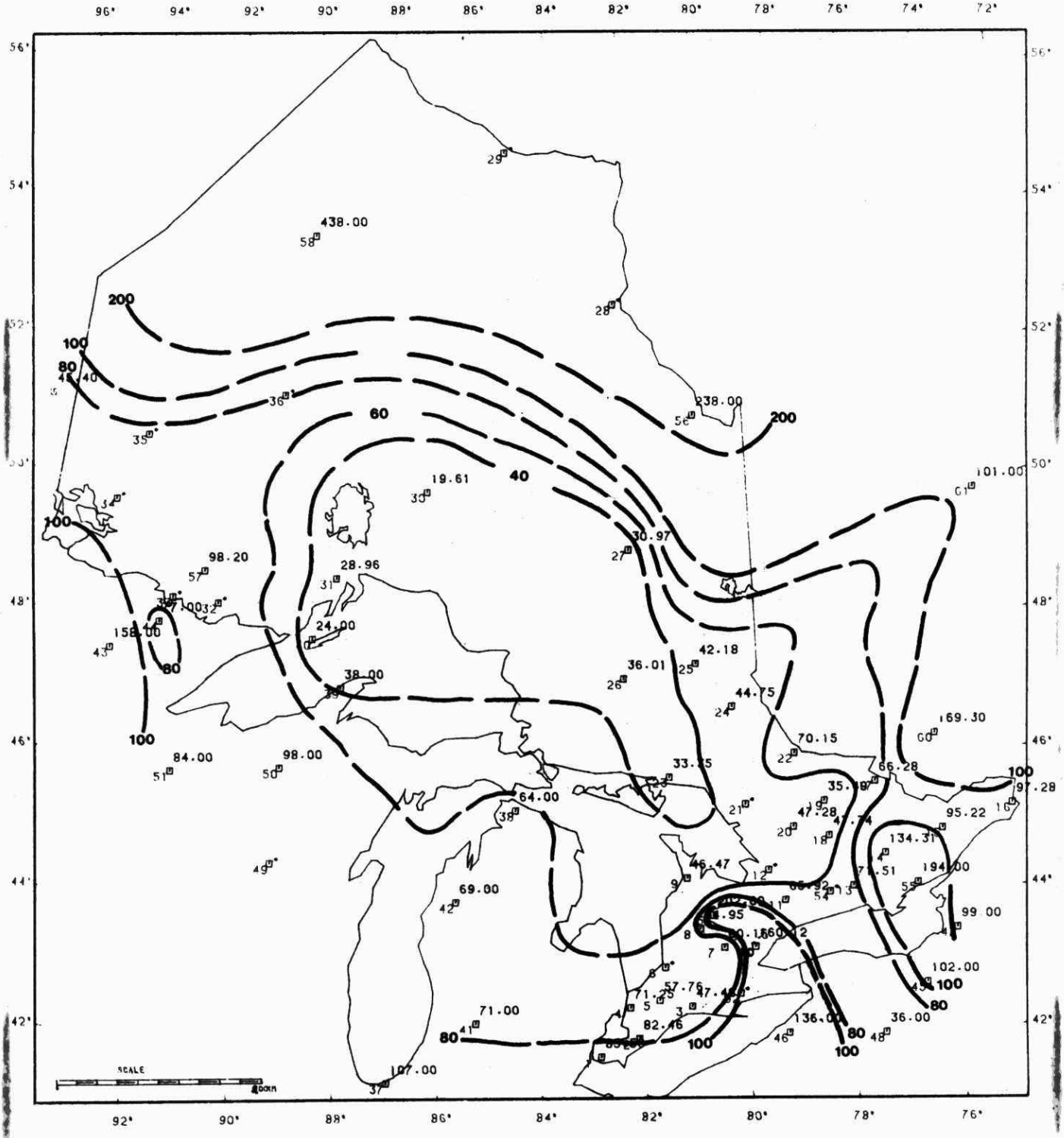

FIGURE 19B. ANNUAL DEPOSITION (MG/M**2) OF NA - 1981

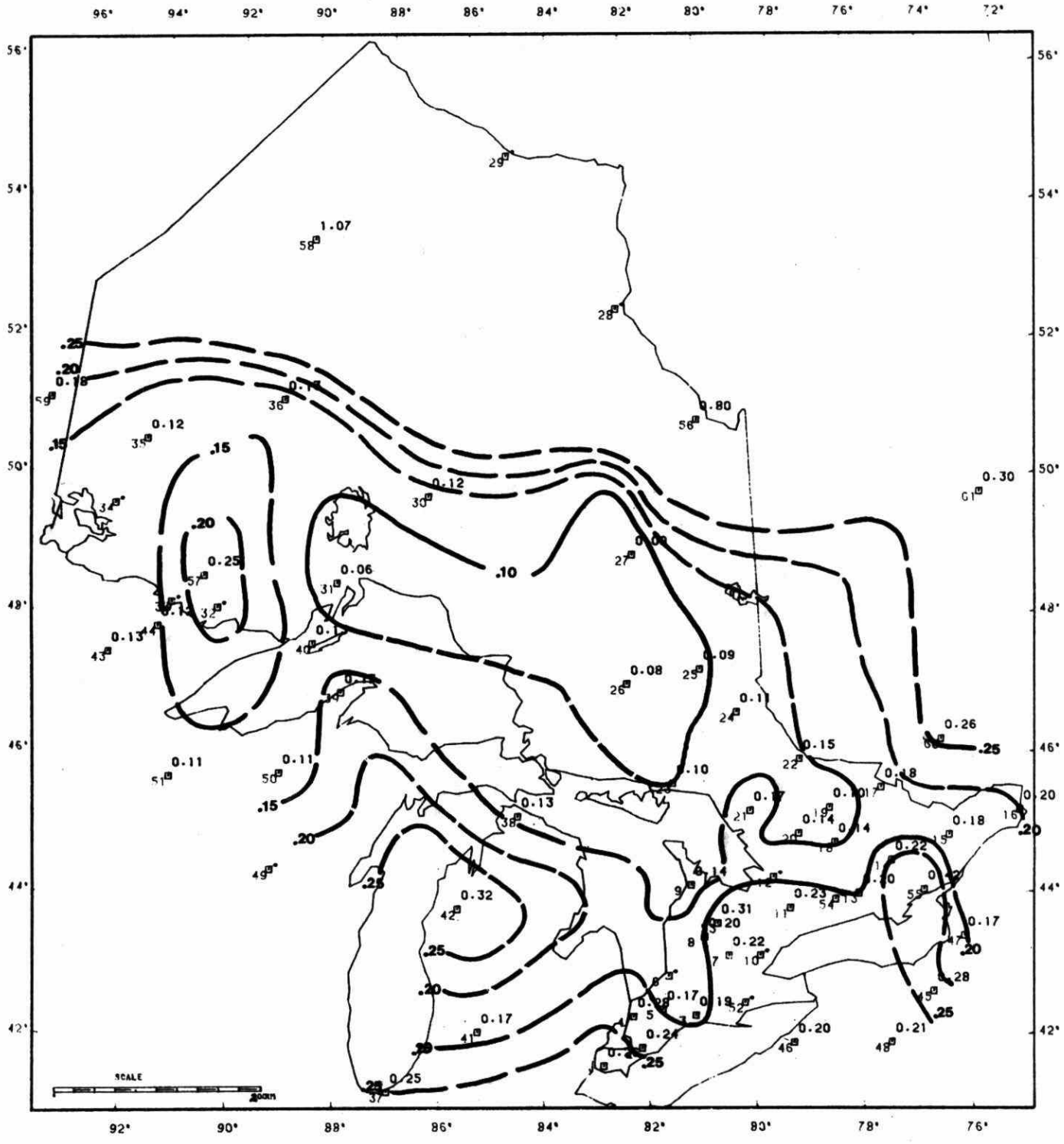

FIGURE 20A. AVERAGED ANNUAL CONCENTRATON (MG/L) OF CL - 1981

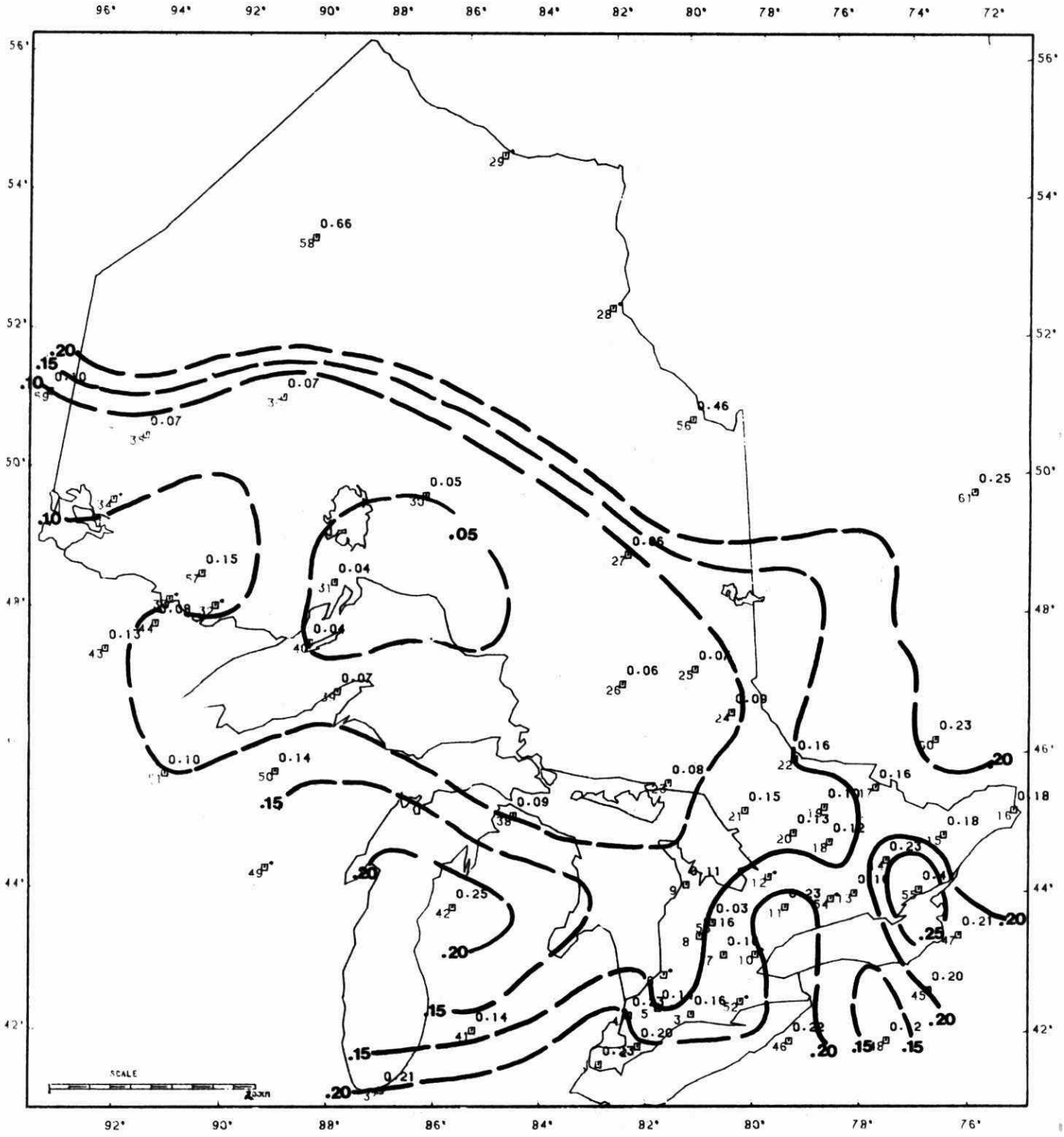

FIGURE 20B. ANNUAL DEPOSITION (G/M**2) OF CL - 1981

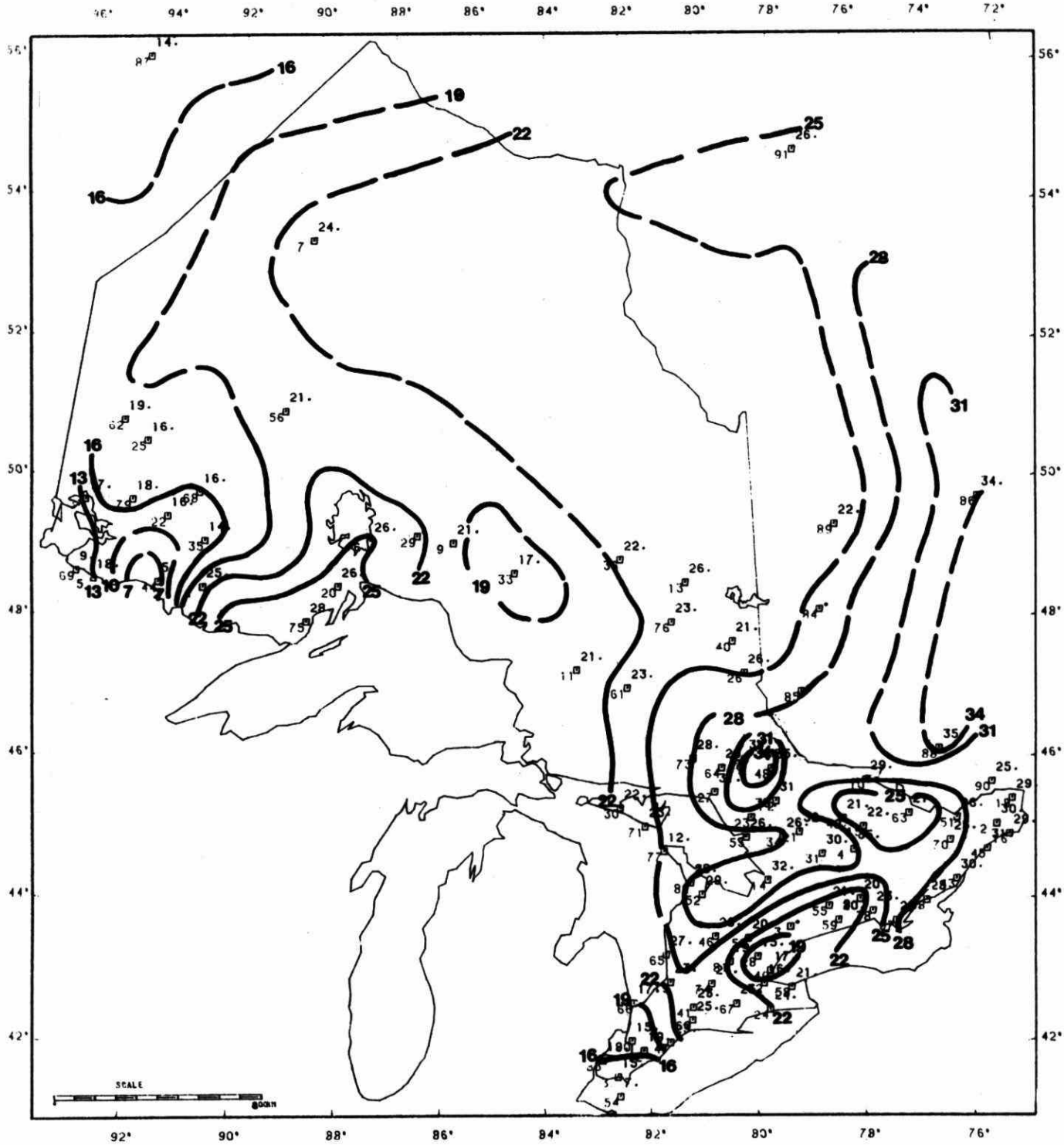

FIGURE 21. SEASONAL CLIMAT GAUGE DEPTH(CM) OF AUTUMN 1980 (SEP-NOV 80)

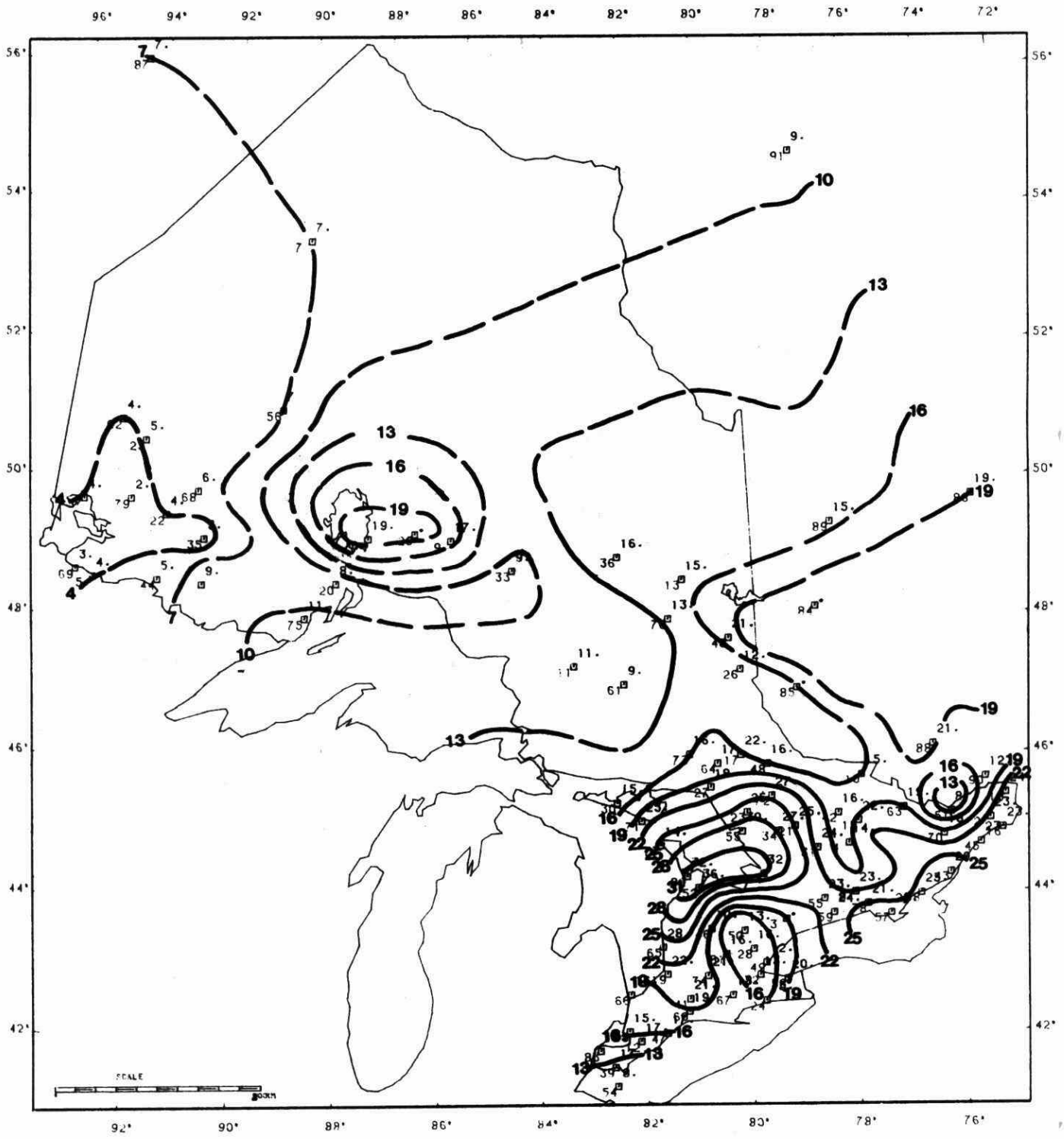

FIGURE 22. SEASONAL CLIMAT GAUGE DEPTH(CM) OF WINTER 1981 (DEC 80-FEB 81)

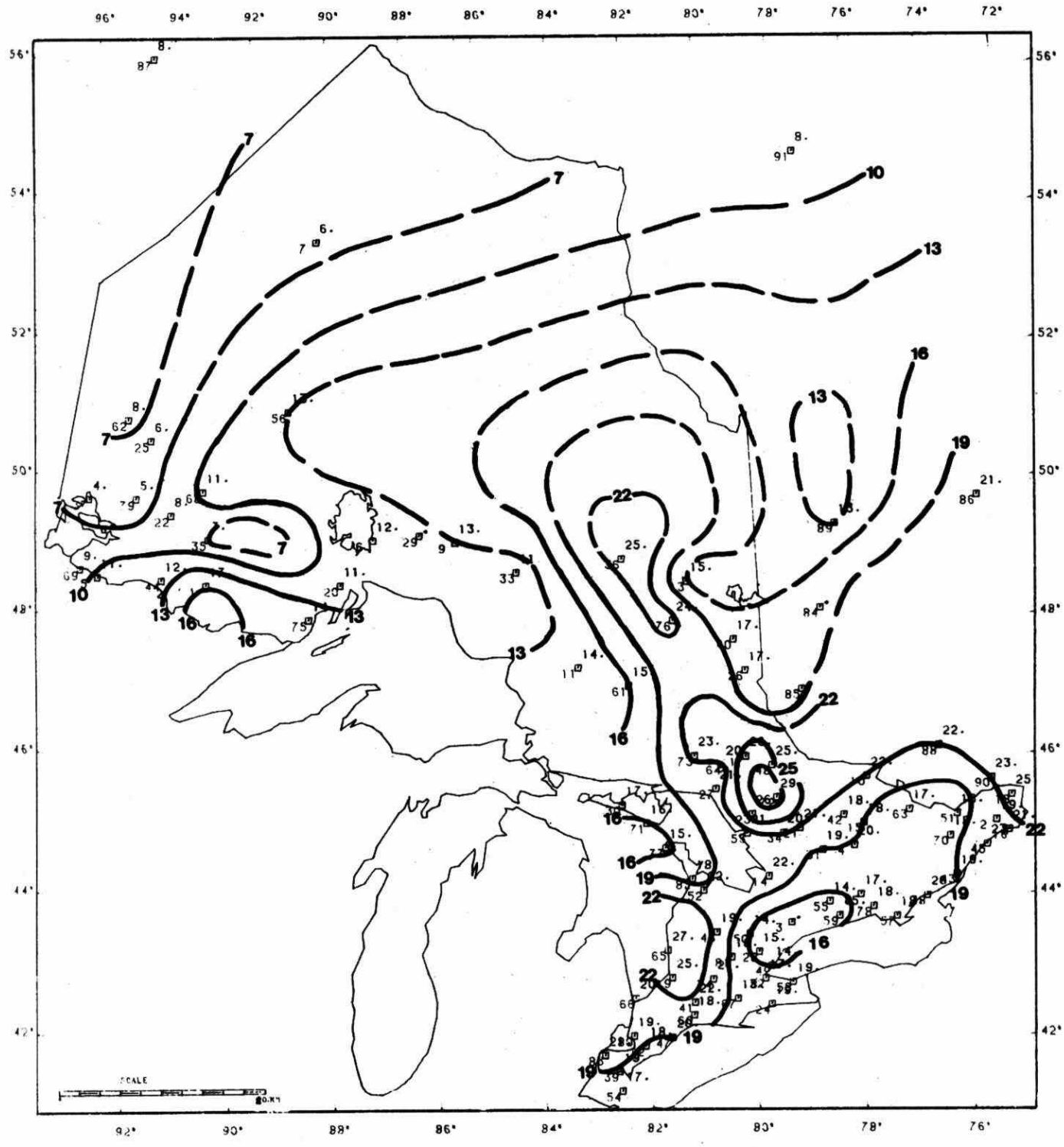

FIGURE 23. SEASONAL CLIMAT GAUGE DEPTH(CM) OF SPRING 1981 (MAR-MAY 81)

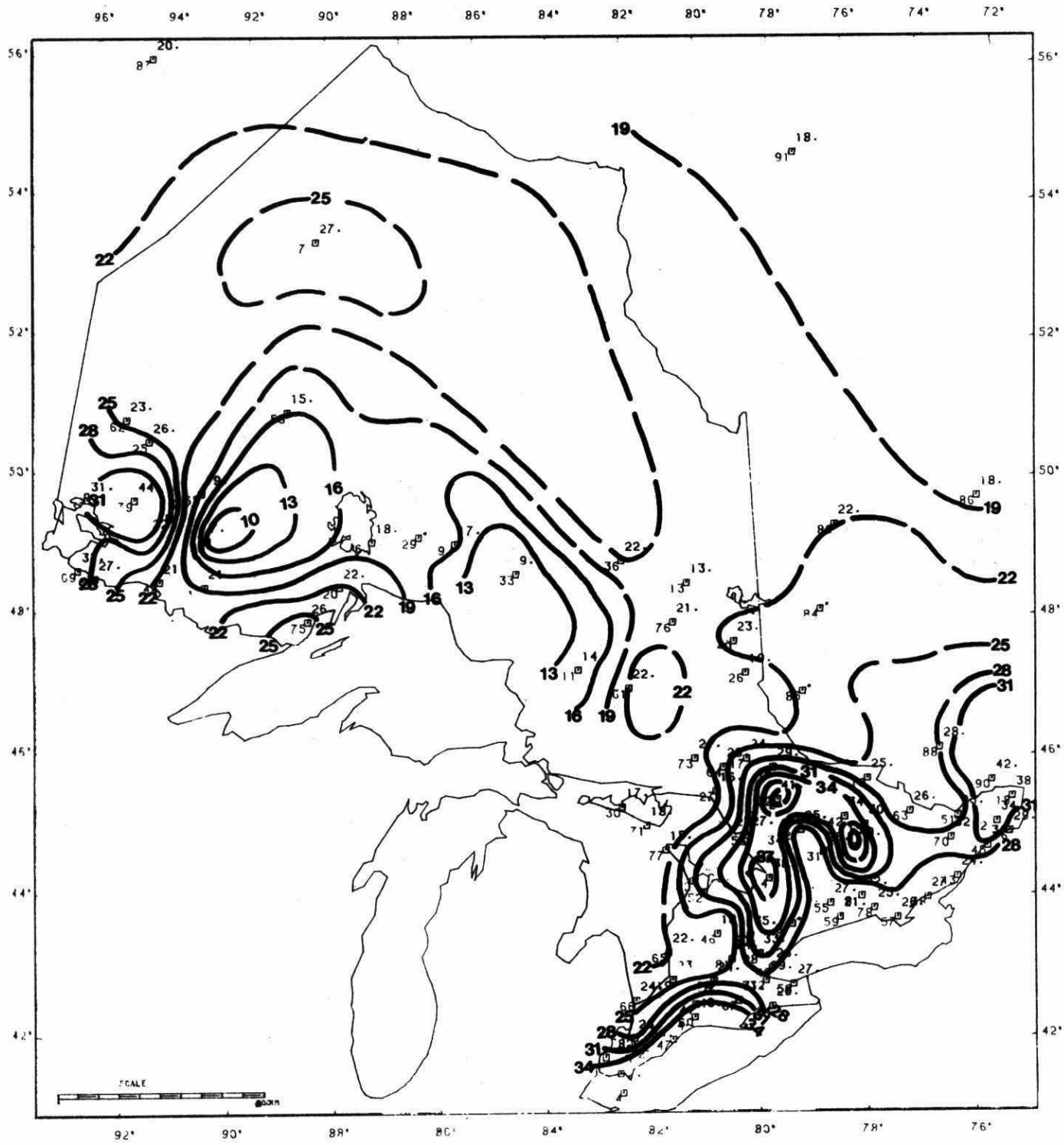

FIGURE 24. SEASONAL CLIMAT GAUGE DEPTH (CM) OF SUMMER 1981 (JUN-AUG 81)

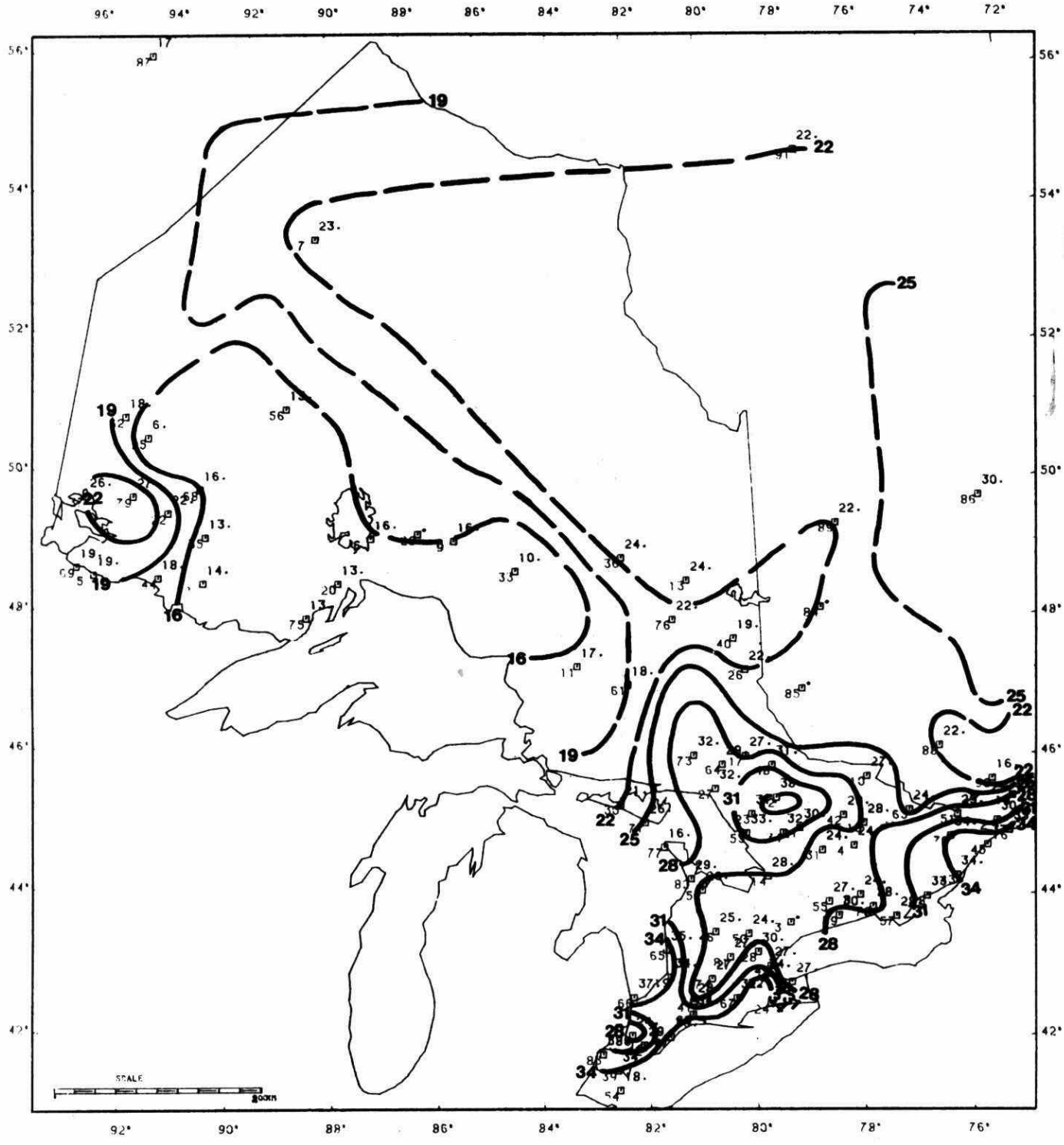

FIGURE 25. SEASONAL CLIMAT GAUGE DEPTH (CM) OF AUTUMN 1981 (SEP-NOV 81)